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Electrical Contractors and Original Ideas.

WE must not allow ourselves to be so seriously engaged in discussing whether or not the electrical contracting business is degenerating that we shut our eyes to the real spirit of enterprise that is frequently displayed by some representatives of this much-maligned section of the electrical trade.

We can hardly remember the time when there was not something seriously wrong with contractors and contracting in the United Kingdom—at any rate on paper. It were the easiest thing in the world for the clever cartoonist to produce a series of progressive sketches of "the contractor—what he may become" either a great success and a help to electrical development, or a failure to himself and an undercutting jerry-working nuisance doing harm to everybody.

As far back as we can remember there were always both bad and good examples and, write all that we and our correspondents may, it always will be so. We look to the spread of registration to do much to relieve the situation, and we wish the movement full success wherever it is being tried. On that point our views have been so emphatically expressed from time to time that there is no need for their reiteration now. But we do want to have a word here directly in the ear of the electrical contractor himself—whether he is already registered, is about to register, or is indifferent to the whole question—on the subject of enterprise.

Large and effective showrooms are springing up in many parts of the country which contracting firms should find of great assistance to them both directly and indirectly, but however many centrally-placed showrooms there may be they will not be regarded by the enterprising contractor as a substitute for his individual display or his original policy and activity. Local individual ingenuity must be allowed the freest possible scope, and it must be remembered, too, that such ingenuity does not necessarily involve a big outlay in cash.

We are aware that there are cases where small men, as they are called, become discouraged in their local efforts because of what the authorities are doing to accelerate the rate of development, and they grouse and they grouse about rate-aided competition until their appeal to the public becomes more like a propaganda than a live, interesting, and convincing business-getting operation. They stand to gain far more in the shape of orders by getting on with their business than by indulging in exhibitions of ill-temper regarding inevitabilities.

We are sure that if the information could only be brought together, a fine record might be shown of hundreds of original individual efforts on the part of electrical contractors. It would go far to remove the effects of the fog of critical and belittling depreciation which seems to be the small man's heritage.

We welcome communications which keep the trade informed of the "stunts," if we may use a modern newspaper term, of the real live contractor, whether on this side of the Atlantic or the other. We would go so far as to urge him to concentrate at this moment on the production of stunts and yet more stunts to win the interest and orders of the public during these dark evenings when outdoor recreation for the average man and woman is practically non-existent and when shopping and the improvement of the home fill a large place in the pastimes of the winter.

If the electrical contractor will do as we suggest, he will develop as part of his business system a regular habit of seeking out new ways of securing work and sales. That there is room for ingenuity and enterprise in the electrical business we have not a shadow of doubt. Just as a type we may quote from our contemporary, *Electrical Merchandising*, the success that attended an original action on the part of a contractor, English by name but American in origin—J. C. English, of Oregon—who very much wanted to get hold of orders for electric fittings and fixtures required for housing schemes. Here we record from week to week the new housing schemes that are being undertaken in different parts of the Kingdom so that contractors and traders can bid for the electrical installation and apparatus work, if any. We, of course, have to leave it to the contractor to exercise his own brains in finding out how best he may succeed in such cases. Sometimes he tells us what he does and the result that ensues. In the case of Mr. English, mentioned by our contemporary, what he does is this: When a number of houses have been erected he sends a man to inspect them in their unfinished condition, with the lighting and other points wired awaiting the visits of the prospective tenant or purchaser. The said man before he leaves bends the wires into the form of a hook, upon which he hangs up a cardboard lantern sign stating that an estimate for the lighting fixtures required for "this home" is "ready for you" at the address of Mr. English. He jots down necessary data on a prepared form, and on this basis an estimate is prepared which is ready for the aforesaid tenant or purchaser. Of course, it is easy to anticipate a crop of objections from less pushful people who consider that their rights and privileges have been over-ridden, but we quote the result: inquiries are being received from 40 per cent. of the houses where the lantern signs are left. The lantern-sign effort does not stand alone—it is supported by appropriate correspondence of the follow-up order; but the estimate is ready—that is the important help that goes far to secure the business.

It may be that somewhat similar enterprise is being displayed by a number of firms here in connection with housing scheme operations. If so, we should like to have particulars for the assistance of others who are ready to avail themselves of such suggestions. We are sure that there is no lack of original ideas among electrical contractors; we merely quote the American example as a type that has just come before us. We should like to quote many of British origin if our readers will assist us.

Charges for Electricity in London.

In view of the attention which has recently been devoted in the City of London to the need for the charges for electricity to be reduced, it is of interest to direct attention to a communication that was issued by the Electricity Commission under date October 26th, 1925. Each of the companies affected by the London Electricity (No. 1) Act, 1925, has been notified that the sliding scale of prices and dividends provided for in that Act shall come into force as from the first day of January, 1926. A similar communication was also sent to each of the companies affected by the London Electricity (No. 2) Act, 1925.

The communication points out the importance of all necessary steps being taken by each company, without delay, to fix the standard prices for approval by the London County Council in order that the sliding scale may come into effective working at the earliest possible date. The hope is officially expressed that, even if it is not found practicable for the standard prices to be finally determined before January 1st next, each company will be able to announce such reductions of charges as may be warranted by a forecast of its prospective net revenue and of the appropriations thereof under the new conditions.

Booth's Circus.

Recent experiments instituted by the Advisory Committee on London Transport in Aldwych and elsewhere, with the system of continuous circulation of traffic in one direction, recall to our minds the fact that the late W. H. Booth strenuously advocated this system in our columns and elsewhere many years ago; although he may not have been the first to suggest the idea, his enthusiasm, combined with the obvious resemblance of the system to a circus, led to its being known amongst his friends (and who was not his friend?) as "Booth's circus." That the idea was practicable and possessed valuable features was undeniable; the only serious objection to it was the absence of any opportunity for pedestrians to cross the roads without bringing the whole system to a standstill, but this difficulty would be minimised by the absence of blocks, and would be felt only at times of exceptionally heavy traffic.

Booth's services to the community never gained the recognition that was their due. His interest in combustion prompted him to deliver lectures and to write books on the prevention of smoke from boiler furnaces, and his advocacy of the larger and higher furnaces which are to-day accepted as the correct practice for water-tube boilers was embodied in numerous articles which appeared in our pages some five-and-twenty years ago. A man of strong opinion, he had a fluent pen and a ready command of forcible language to drive his points home; and he used them both with vigour in support of his "circus."

Baking by Electricity.

We have frequently had occasion to point out that what electricity can do, cheaply and efficiently, is not to be determined by surmise or guess-work; only by actual trial over a sufficient period can its merits be truly appraised. On paper, the cost of industrial heating by electricity may seem unduly high, but in practice it is often found that owing to the adaptability of electric heaters, the ease with which the supply of heat can be controlled, the efficiency of utilisation which can be attained, and the saving in labour and capital cost, the actual outlay is less than with any rival heating agency, whilst the cleanliness and convenience of the electric way are unapproachable.

An apt illustration of this proposition is met with in the application of electricity to the baking of bread and pastry on a large scale. Hundreds of large electric ovens are in use in the United States. In our issue of October 23rd we described three notable examples of British baking ovens, and in the following pages Major T. Rich gives particulars of French practice. On account of its magnitude and nature, the baking load is of great value to supply undertakers. How many of them have canvassed the bakers in their districts?

Notes on Bakers' Electric Ovens.

With Special Reference to the Grenoble Exhibition.

By THEODORE RICH.

AMONG exhibits of interest to be seen at the Exhibition at Grenoble, some bakers' electric ovens take an important place. Two ovens, one for bread and the other for pastry, are shown in operation in a special pavilion, and a continuous pass-through oven is shown at work in a special building arranged for the demonstration of biscuit making by a Grenoble firm.

At first sight one would think that the only scope for the commercial bakers' electric oven would be in areas supplied from water power, as the thermal efficiency of the average steam power station—heat units in the coal

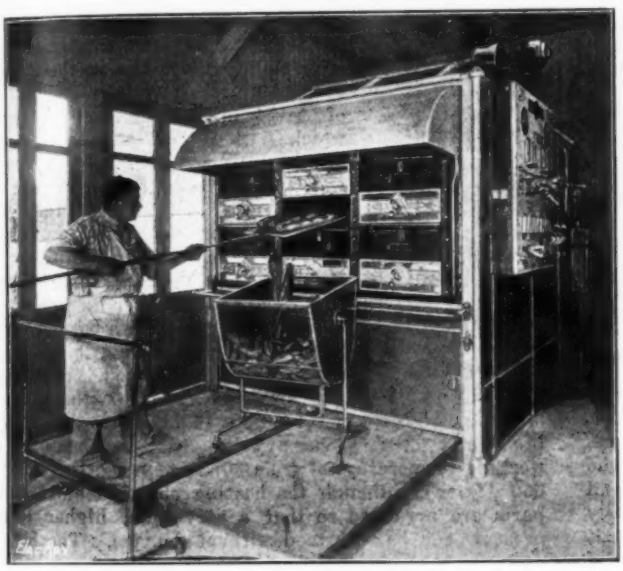


Fig. 1.—An Electrically-heated Bread Oven.

as compared with heat units available from the power station—is so low. But the question is how much of the heat in the coal used in the average bakery goes to heat the bread and evaporate the water content, and how much goes to heat up and keep hot hundreds of square feet of brickwork and flues and to heat up the air which passes through the furnace; and whether the electric oven which utilises such a very high percentage of the heat energy given in the form of kilowatt-hours will not prove an economic proposition, especially when many operating advantages are thrown into the scale. Coal is not the only factor in the cost account of a bakery, although an important one; wages, rent for the cubic space occupied, ever-increasing rates and taxes, and overhead charges generally add up to a formidable percentage during the year, and what is termed general convenience, to which a definite money value cannot be given, is also a material consideration.

Although it may be difficult for one baker, in the case of household bread, to charge more than another, and while people are conservative regarding the bakers they patronise, yet a high uniform quality of the product and an attractive appearance are very important factors towards the attraction of business. There is also the point that, owing to the difficulty of obtaining and keeping domestic servants, the restaurant habit has largely increased, and this has led to a demand for French and fancy bread for which a higher price can be obtained per pound weight than for household loaves. Besides the trade in pastry, in the United Kingdom there is perhaps the largest trade in Europe in such items as cakes, buns, scones, and such like, where the selling price in proportion to weight is very much higher than that of bread, and where quality as expressed in lightness, texture and appearance counts for so much. With regard to such products, the proportion of fuel costs to total costs tends to be smaller than with bread, and the various manipulative incidentals can easily mount up to a material percentage of costs; for such a trade, the electric oven has special advantages as compared with the old arrangements.

Underground Bakehouses.

In the past the use of the old-fashioned brick oven, with its flues, necessitated construction on solid foundations, and this fact encouraged the construction of underground bakehouses, a point that sociological enthusiasts usually overlook; the heat given out by the brickwork, the poor ventilation which so often existed below street level, the stuffy and objectionable atmosphere, and the hot, perspiring operatives, the presence of coal and dust and often bad illumination all combined to encourage vermin, dirt, and general insanitary conditions. It is not astonishing therefore that in some of our towns many persons who are British in race and instinct hesitate to enter a trade with such a reputation, and we find that too often men for such work come from the other side of the North Sea, a serious matter considering the seemingly chronic unemployment which exists among our own people at the present day. Despite the efforts of the professional political agitator who seems to live on grievances and unemployment, amelioration of the general conditions under which the craft of bakery is carried on can hardly fail to attract a good class of British labour into the trade.

It is also recognised nowadays that persons in an apparently healthy condition can be the carriers of dangerous diseases, and this encourages the demand that food, so far as is reasonably possible, shall be untouched by hand during preparation, and shall be comparatively free from contamination from the time it is prepared to the time it is delivered to the customer.

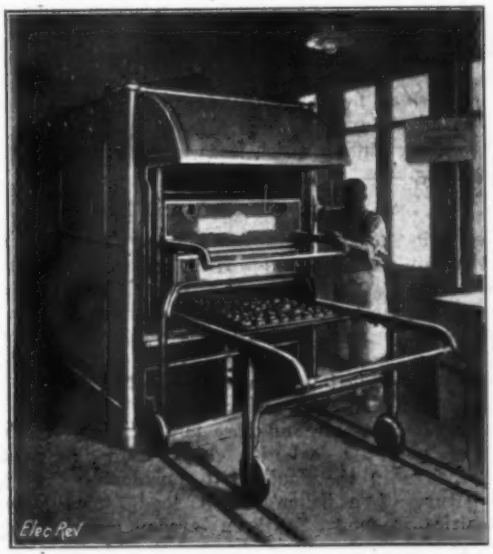


Fig. 2.—An Electric Pastry Oven.

It is relatively more important to take special care over an absorptive substance like bread that is eaten without further treatment than to bother about plate-

glass windows for such a commodity as meat, which in England is always cooked before it is eaten. Master bakers have in recent years done a good deal to improve their establishments, and to remove the reproach that medical men have often levelled against them, but there may be still some master bakers who would not like their lady clients to inspect without notice the exact conditions under which their bread is made and baked.

It is not in the interests of the community as a whole

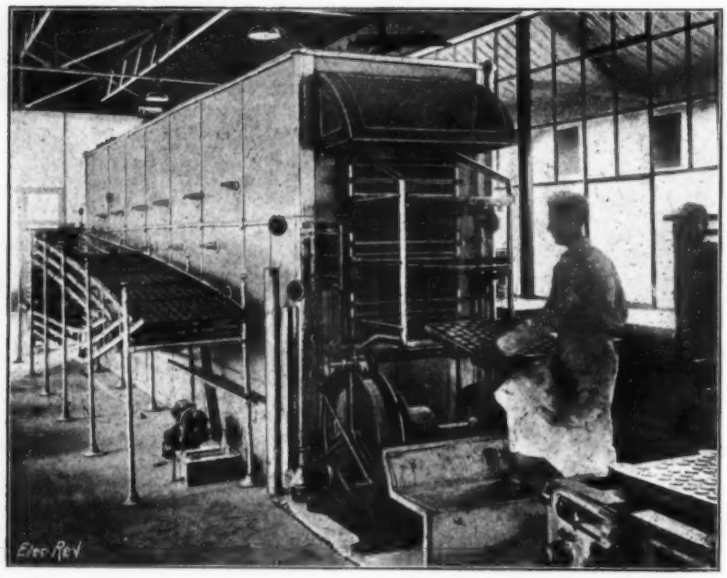


Fig. 3.—An Electric Biscuit-baking Oven.

that large octopus concerns should be able to squeeze smaller tradesmen almost out of existence, and there is a feeling in some quarters that in some classes of trade and business, people with ample capital resources, who can afford to wait, have encouraged Government and local rules and by-laws which, however intrinsically desirable, have made it more difficult for small businesses to exist. There is a demand, therefore, for appliances which can be produced and sold at a reasonable capital cost, which in small sizes, through facility of manipulation and adjustment and general efficiency, will enable the small trader to compete with large widely advertised concerns. Large undertakings often attract the public to less favourably priced articles by selling specific items below prime cost, a practice which acts unfairly towards those who try to make a living in the line affected by such "dumping"; it is open, however, to the smaller man to show the public the attractive up-to-date methods by which his wares are made, and thus gain an advertisement which is more lasting than some of the vulgar puffing which is so much in vogue at the present day.

Electricity to Aid the Small Man.

Electricity, when it is intelligently handled, and not tied up with too many fads and capital-wasting restrictions, can be a boon to the small employer and tradesman. In some parts of the Continent, even in small towns and villages, where electricity supply is available from high-pressure mains, an astonishing variety of electrical appliances for industrial use can be found, and in such areas electric ovens will undoubtedly make their influence felt. In the North of England, near the coal pits, electricity is, as a rule, cheaper than in the South, but considering the valuable nature of a baker's oven load, power supply authorities in many Southern areas, especially considering the high power factor, should be able to encourage the use of such appliances by their customers.

The heavy cost of British ca'canny coal during the last decade has encouraged the development of water power in Southern Europe; this has been a factor towards improvements in many electrical appliances, among them electric ovens, the use of which is spreading to areas where power from steam stations only is available.

The above ideas arose after an examination of the ovens exhibited at Grenoble on the "Media" system, the design of which is the outcome of 13 years of experience, a number of features being the subjects of patents by Messrs. Antonello & Orlandi; they are constructed in France by the Société Générale des Fours Electriques, of Grenoble, a firm that specialises in ovens for the preparation of food. They are made in a number of sizes, from a small confectioner's oven which takes on an average 2 kW to operate, to a baker's oven which will handle about 12 cwt. of bread per hour; up to date the makers state that there are over a thousand of various types in use in various parts of the world. A number of ovens of this kind are at work in Paris and in other areas where power is supplied from steam stations, and it is of interest that the same makers have on order for use in the Paris area an oven taking up a floor space of three metres by four metres, which has a baking surface of 32 square metres (340 sq. ft.), and which can bake in eight hours 90,000 pastries and five tons of bread. The normal types are made for bread, pastry, or biscuits, and comprise one, two, or three tiers. One of the smallest bread ovens of this type is made with a baking surface of 2 square metres; it takes as a maximum 10 kW, and can produce 55 to 77 lb. of bread per hour with a consumption of between 0.1 and 0.16 kWh per lb. The bread and pastry ovens are designed for a maximum working temperature of from 300 to 350 deg. C. (570 to 660 deg. F), although the heating elements and other parts are arranged so that a very much higher temperature can be withstood without damage. The heating elements are formed of spirals of non-rusting wire. Most of the pastry ovens supplied by this firm have been connected to steam-driven electricity systems.

Fig. 4.—A Restaurant Pastry Oven.

A 60-kW Bread Oven.

The bread oven shown at the Exhibition is illustrated in fig. 1; it is the largest size made for the use of general bakers. There are two chambers one above the other,

each with a surface 2 metres by 3 metres, that is to say, about 130 sq. ft. total baking surface. There are six balanced doors, of a non-radiating type sliding in grooves, arranged to give easy access to the upper and lower chambers; one can operate the doors in rotation, and therefore the loss of heat through the opening of the doors can be reduced to a minimum. An experienced baker, with only one mate, can produce up to 220 kg. (484 lb.) of bread per hour. The space taken up is 2 metres 40 wide (7 ft. 8¾ in.), 3 metres 30 (10 ft. 8¼ in.) deep, and 2 metres 50 high (8ft. 2 in.), including all gear, &c. Its maximum consumption is 60 kW; the mean consumption varies from 0.1 to 0.136 kWh per pound of bread, depending on the type of bread and loaves to be baked. It should be noted that a greater weight of English bread can be got on to a given area than is the case with most classes of bread made on the Continent. The ovens have a slight slope towards the front to aid the charging and discharging. A chamber is arranged underneath to hold bread during fermentation. In order to facilitate the operation of the upper chamber, especially where the operatives are not very tall, there is a sliding platform which can be pulled out as shown in the illustration.

The total weight of the bread oven empty is about 5 tons, and when spread over about 85 sq. ft. this gives 135 lb. a sq. ft.; when the weight of bread is added, it will be seen that, owing to the absence of the necessity for any brick flues, it can be placed almost anywhere.

The Pastry Oven.

This has also two chambers, one about 6 in., the other about 10 in. high. There are two baking plates; each plate rests on a sort of trolley, so that it can be pulled out with the greatest ease when the balanced door is raised. The baking plates can be lifted off and replaced by a new batch, pushed in, and the door closed again almost in a matter of seconds; the loss of heat is therefore very small. Each oven has a working surface of 2 square metres. This oven takes a maximum of 22 kW, with an average under normal conditions much less than this. It is illustrated in fig. 2.

The following features apply to both types of oven. Each type is self-contained; it is made of metal, it requires no foundations and no expensive flue; it can be dismantled with ease, so that the owner of an oven could, if he so desired, take one to an exhibition or similar undertaking without great expense for skilled labour. The oven walls are so well insulated that, so far as the baking is concerned, the temperature of the bakehouse remains very low; the outside walls remain quite cool, and as the general appearance is pleasing, the makers recommend that the pastry ovens should be placed, where possible, inside the confectioner's shop and operated in view of the public as being a valuable advertisement. Some of those connected with the direction of the Société des Fours Electriques are gentlemen with years of experience in practical bakery, especially with regard to high-class French bread, and the ovens have been designed not merely to give convenience of regulation, but also to minimise the number of movements required for each operation on the Taylor system. Each oven chamber is fitted with a pyrometer, and top and bottom heat can be switched in and out and regulated independently; by this means the rise, thickness, colour, and humidity of the product can be influenced as desired, and an adjustment obtained which is out of the question with fuel-heated ovens. Owing to the disposition of the heating elements, a high radiating efficiency can be obtained. The interior of each chamber is continuously illuminated, and the process of baking can be observed without opening the main doors. There is a pilot light belonging to each chamber; this tends to prevent the waste of energy which would go on if it were left switched on with the oven empty. When baking bread, the oven can be raised to the required temperature in about 20 minutes; this tends towards economy in labour. To a considerable extent the power required can be regulated to suit the quantity of material to be baked.

An electrically-heated steam boiler of a patented type is attached to the exterior of the ovens on one side. By means of suitable connections steam can be admitted to the oven chamber when it is required to give the bread the maximum brightness—a matter of importance with French bread—and by means of steam the rise of the bread can also be controlled. The boiler has a very rapid action; it can be used to supply hot water at any temperature required when the oven has been shut down and no hot water is available from the condenser. A condenser is placed over the oven; it warms the water by means of the water vapour rising from the bread which is being cooked on a sort of regenerative principle, and the hot water required for the kneading can be obtained from this source. Ovens can be arranged so that one chamber is specially suited for pastry and the other for bread. The same makers supply a small pastry oven which takes a maximum of 3½ kW and a mean of 2 kW; it is designed to meet the requirements of small confectioners, tea rooms, schools, hospitals, institutions, and hotels. The oven proper is 1 metre high, 1 metre broad, and 1.25 metres deep. It is placed on a wooden stand, which serves at the same time as a cupboard. This tends to show how well it is insulated. It can bake about 1,000 little pastries in four hours or 20 lb. of bread per hour; the baking surface is practically 40 in. by 24 in. by 7 in. high. Fig. 4 shows one of these modified for making pastry in a restaurant in view of the public.

The continuous biscuit oven made by the same company is on view in connection with a demonstration of biscuit making arranged by Messrs. Brun, a large biscuit firm in Grenoble. It has a capacity of 400 kg. (880 lb.) of biscuits an hour. The biscuit trays are pushed in on one side from the paste-rolling and biscuit-stamping machine and slide out at the other ready to be placed on cooling racks (fig. 3). This machine takes 65 kW in operation. They are also made in small sizes. The electricity supply to Grenoble is almost exclusively from water power, and coal is very dear; such an oven might prove attractive in districts supplied by waste-heat power stations and also in countries like Canada, where there is so much water power. One generally associates the operation of model apparatus with large concerns, but the particulars supplied by the makers show that, provided electrical energy can be had at reasonable rates, the electric baking oven is within the reach of quite small establishments. Where a new bakery is to be put up in the middle of a big city the saving in cost of foundations, brickwork, and flues would amount to a material item, and provided simple arrangements can be made for the hoisting of flour, there should be little to prevent a bakery being put in an upper, if not on the top, storey of a building, which might be a great convenience in the case of the bakery of a hotel or institution. From the point of view of hygiene, probably no method of baking can compare with the electric oven.

Cost of Energy.

The Compagnie Parisienne de Distribution d'Electricité, the supply company for the major part of Paris, which operates with steam power only, and in whose area of supply a number of ovens have been installed, has informed us that on October 7th last (when the exchange was in the neighbourhood of 100) its price for energy for purposes other than lighting, that is to say, for electric ovens and electric motive power, was 0.816 fr. low pressure and 0.582 fr. high pressure per kilowatt-hour, coal then being 130 fr. a ton. At an exchange rate of 100, that would mean 1.95 and 1.31 pence respectively, with coal at 26s. a ton. The above prices are subject to rebates calculated quarterly, which are based on the load factor of the plant installed; the day rebate may reach a maximum of 40s., and the rebate for night time 45s. In France, where power comes from a steam station, there is a price variation depending on the price of coal.

The electric oven is no mere fad; it has come to stay.

The Commercial Motor Exhibition.

Some Notes and Comments on Electric Vehicles and other Exhibits.

Few industries in Great Britain have developed so strikingly during the last two years as that connected with the manufacture of mechanically-propelled road vehicles for general commercial purposes. The numbers of registered goods-carrying vehicles and hackney carriages, which amounted to 100,000 and 60,000 respectively in 1919-20, had increased by 50 per cent. at the time of the last commercial motor show in 1923, while to-day the figures are estimated at 224,287 and 98,833, and the seventh International Commercial Motor Transport Exhibition, staged by the Society of Motor Manufacturers and Traders, Ltd., at Olympia, London, from October 29th to November 7th, has proved that more real progress in design has been achieved during the period that has elapsed since the 1923 show than in any equivalent period.

Whilst trade in goods vehicles is progressing, if somewhat slowly at the moment, passenger transport is growing in a remarkable manner, particularly in connection with omnibus services, and the most noteworthy developments are therefore naturally seen in passenger-vehicle design. The exhibits are representative of the leading makes of petrol-, steam-, and electrically-driven vehicles, and the specialised industry of coach and body building. Amongst the 68 different makes of vehicle displayed, seven manufacturers of "electrics" are exhibiting a number of battery-driven trucks, vehicles, and trolley-'buses. So far as the passenger-carrying models are concerned, practically all the latest embody a chassis having a low frame level, and considerable attention is devoted to efficient braking, an increasing number of chassis being provided with four-wheel brakes. To-day the Municipal Tramways and Transport Association, according to the programme, is to discuss local authorities' problems in connection with the operation of omnibus services, at the last of the six conferences arranged at the Exhibition.

Electric Trolley 'Buses.

The ever-increasing popularity of the railless car is once again made manifest by the decision of the Birmingham Corporation to increase its fleet of double-deck

Fig. 1.—A "Railless" Trolley 'Bus.

cars, twelve of which type have operated in that city for several years with success, and have had the effect of increasing the traffic returns of a route which was considered to have reached the limit of its capacity when operated by tramcars. The large seating capacity and the "all-weather" adaptability are features which cannot be overlooked. A low-floor car of the open-cab type that was recently placed in service at Southend-on-Sea is shown in fig. 1. Made by Railless, Ltd. (proprietors: Short Bros., Ltd.), who claim to be pioneers in this form of passenger transport in the British Empire and China, the 'bus is a single decker, whereas the show model is built to take 52 seats, the lower and upper saloons each being fitted with 26 seats. A feature of the upper saloon is the provision of drop windows at the sides, these being easily adjustable and operated on the "lazy-tongs" principle. The current-collecting gear consists of "Railless" vertical trolley stands equipped with two tapering booms approximately 19 ft. 6 in. in length, mounted on channel supports.

Specially designed for the production of the low-frame chassis, the rear axle (by the Kirkstall Forge Co.) is of the double-reduction type, consisting of worm gearing and of a pinion and internal ring gear bolted directly to the road wheels. The internal gear is totally-enclosed, being grease tight, water, and dust proof. By removing the road wheels and driving shafts, the worm and differential gear can be lifted from the axle casing, through the trap provided in the floor of the car, as a complete unit. Timken taper roller bearings are employed for mounting the wheels, and two independent sets of brakes are fitted to the double deck car, operated in conjunction or independently. The emergency brake acts on the rear wheels and is applied by a pedal. The electrical equipment fitted to this particular model includes two motors of 35 h.p. (by the English Electric Co., Ltd.) arranged in tandem directly on the chassis frame, which is so well sprung that independent springing of the motors is quite unnecessary.

A 36-seater single-deck trolley 'bus was also shown on the stand of Messrs. Richard Garrett & Sons, Ltd. It is driven by a single 50-h.p., 1,060-r.p.m. "Bull" motor, and is fitted with pneumatic tires; in addition to front-wheel brakes, a Westinghouse air brake operates on the rear wheels. The side entrance door is 4 ft. wide.

Petrol-Electric Vehicles.

Amongst the exhibits of Tilling-Stevens Motors, Ltd., is a petrol-electric chassis (fig. 2) with a 50-h.p., 4-cylinder engine and a worm final drive. The maximum load capacity is 5 tons, including the body. C.A.V. constant-voltage equipment is provided for electric lighting. A similar chassis is fitted with a single-deck London-type omnibus body with seating accommodation for 30

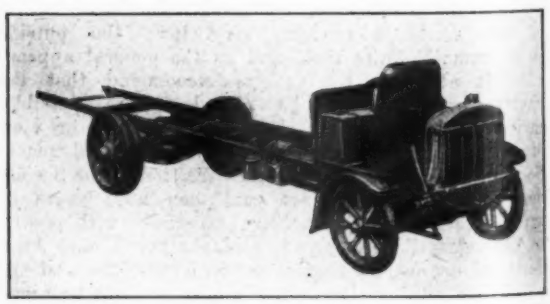


Fig. 2.—A 50-h.p. Petrol-electric Chassis.

passengers. In this case the makers' direct-lighting system is installed, the electricity being derived from the chassis dynamo.

Battery-propelled Lorries and Trucks.

Several makes of battery-propelled chassis are on view. The "Garrett" 2-ton vehicle is driven by a single "Bull" 9-h.p. motor, and the control gear is so arranged that the vehicle can be steered from the pavement, thus obviating the necessity for the driver to mount into the cab on each occasion as the vehicle moves from door to door for refuse collection and similar purposes.

Messrs. Ransomes, Sims & Jefferies, Ltd., exhibit one of their standard 3½-ton "Orwell" electric tipping

wagons (fig. 3) for refuse collecting. These electric vehicles are used by nearly 40 cleansing departments, also for highway maintenance, overhead tramway work, street watering, and commercial transport in towns. They also show the C.11 model electric industrial truck, which is fitted with 4 ft. 16 in. wheels for use on rough ground, and with an electrically-operated elevating platform, by the use of which, in conjunction with several trays or stillages which can be loaded at convenience, transport is effected without loss of time in loading and unloading, the truck being kept in constant running service.

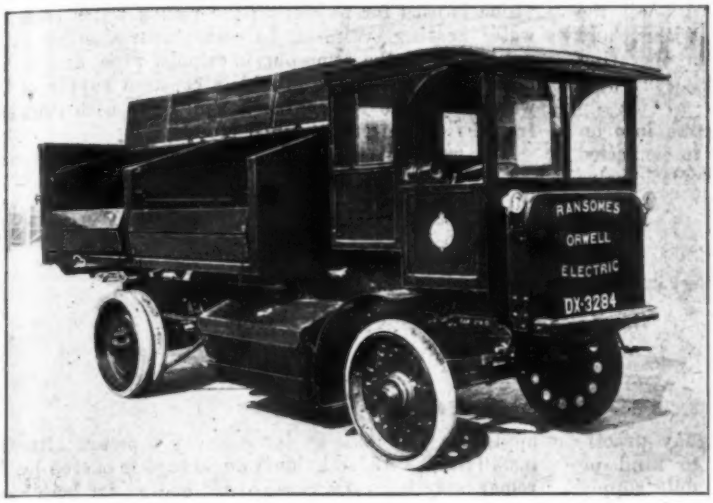


Fig. 3.—An "Orwell" Electric Tipping Wagon.

The "Ransome" runabout crane will travel, turn, hoist, and derrick under its own power, turning about its own centre like a turn-table, and by reason of its mobility is suitable for the many jobs of daily occurrence outside the capacity of the ordinary lifting appliances, as indicated in fig. 4, and have hitherto been performed by hand. These cranes are used by the Port of London Authority, the Mersey Dock and Harbour Board, the L.M. & S. and L.N.E. Railways, and other leading undertakings throughout the country.

Fig. 4.—An Electric Runabout Crane.

(To be concluded.)

An Economical Heat and Power Scheme.

The Electrical Installation at the Bucklow Institution, Knutsford.

An electrical installation has recently been completed at the Bucklow Institution, Knutsford, which presents some interesting features. Steam had previously been used to a considerable extent for heating the building and also for domestic hot-water purposes. A scheme was prepared by Messrs. Cramp and Frith, consulting engineers, of Manchester, whereby all the energy required in the Institution for lighting and power could be generated electrically by using a back-pressure engine as a prime mover, and utilising the exhaust steam for the work previously done by live steam direct from the boilers. By carefully proportioning the plant and by the installation of a storage battery of about 600 Ah capacity, it was found possible to provide all the heating, lighting and power necessary without any increase in the steam drawn from the boilers; thus for a very slight increase in coal consumption due to the higher pressure of steam, the Institution now has its lighting and power services provided for electrically.

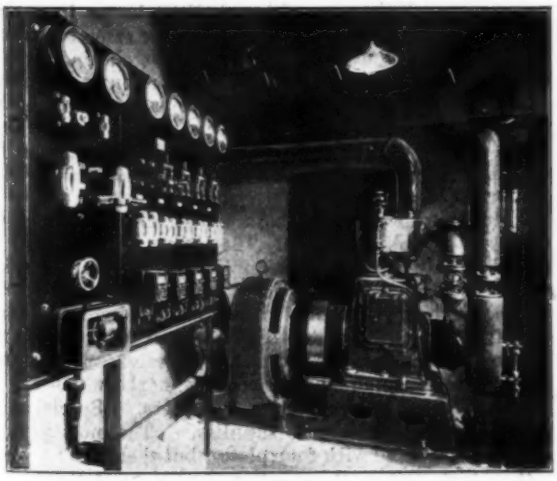


Fig. 1.—Generating Plant and Switchboard.

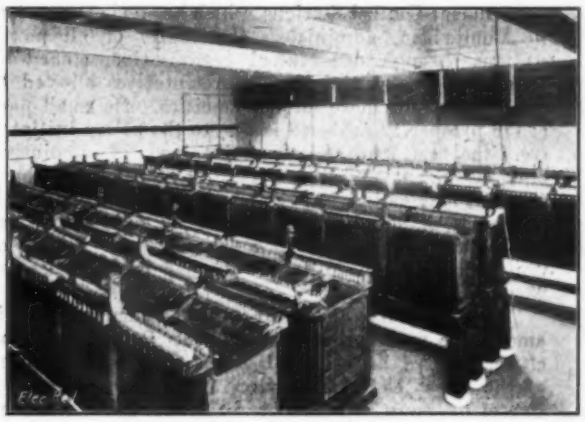


Fig. 2.—Storage Battery.

The plant comprises a 32-h.p. high-speed enclosed steam engine, fig. 1, designed for taking steam at 100 lb. pressure, and exhausting against a back pressure of 5 lb. This is directly coupled to a 20-kW 200/280-V d.c. generator, arranged so as to supply direct or for charging the storage battery. The battery, fig. 2, consists of 106 cells, and is contained in a large and up-to-date battery room.

The total number of lamps installed is between 400 and 500. The electrical plant also provides energy for a 15-h.p. motor used for driving the laundry machinery, which was previously driven by a low-speed horizontal steam engine. Since installing this electric motor, there has been a very considerable improvement in the operation of the laundry machinery; it deals with all the variable loads due to hydro extractors, &c., without any noticeable variation in speed, whereas when operating with the steam engine, excessive speed variations were frequent.

The exhaust steam from the engine passes into an exhaust header, one "way" from which is connected to an atmospheric exhaust pipe with an automatic valve designed to release the steam at 5-6 lb. pressure. Two of the remaining "ways" on the header are connected to calorifiers which provide a supply of hot water to a 750-gallon storage tank, the water being intended for domestic purposes in the kitchen, &c. Another "way" on the header provides steam for a "Recto" apparatus, which is used for re-heating the return water from the water heating system. In actual operation no steam passes out of the atmospheric exhaust pipe, and it has been found possible to provide a constant supply of hot water, although the engine is shut down each week-end from Friday afternoon until Monday.

The whole of the work was carried out by Messrs. Drake & Gorham, Ltd.

The Uruguayan Electrical Market.

A Field for British Enterprise.

(From our own Correspondent.)

Electrical wiring is undertaken in Uruguay practically without any restrictions either as to kind or quality. When, however, it is used on public supply systems, such as the half-dozen owned and operated by the Usinas Electrícas del Estado, the works inspector has to approve of all jobs before connections are made to the lines. This regulation, it is considered, gives greater latitude to the wiremen than is desirable, since industrial inspectors vary in their estimation of the quality of the work carried out. There has been of late a strong inclination in Uruguay to combat certain European influence, since this has always meant low-grade material. Simultaneously with the formation of the Electrical Engineers' Association in Buenos Aires, the Administration of Central Stations in Uruguay formulated a set of rules which have almost eliminated the use of poor material, and have done much to destroy the damaging practice with which customers had been undoubtedly afflicted in past years.

The Bandá Orientál (Republic of Uruguay), with its total area of 72,180 sq. miles and 1,663,000 inhabitants, offers many opportunities for the sale of electrical goods, not alone in the capital, Montevideo, where there are over 400,000 people, but in the suburbs and seaside resorts outside it. There is no longer any private supply enterprise, since the Government long ago decreed that all public services should be considered State monopolies. The electricity supply is cheap and the undertakings are well managed. The General Department of the Government Central Stations, which has its headquarters in Montevideo, administers the affairs of all power stations through one central organisation, staffed by capable engineers and local representatives allotted to each of the four more important cities. No small part of the prosperity achieved is due to the policy initiated from the first, and strictly maintained, of appointing only competent and intelligent men entirely without political bias or influence as members and officials. All purchases of supplies are effected by public bids, as in the case of the insulated copper wire purchase mentioned in "Business Notes" in our issue of October 23rd.

Montevideo, like the sister capital, Buenos Aires, is among the more progressive of the South American cities. Especially has this been the case in the adoption of the latest electrical devices irrespective of origin. One of the more notable features of this policy has been the construction of a large and admirably-equipped showroom containing working models of practically every well-known electrical device for the household, and including, of course, several types of water-heaters, cooking ranges, &c. These models are arranged for immediate operation under conditions approximating closely to those of actual service. The prospective customer is thus enabled to determine readily how far any particular apparatus will be likely to suit his or her house and obtain a precise estimate of the cost of the appliance and also of its running expenses after its installation. An additional advantage is offered by the remarkably low rates charged for energy for both cooking and heating. In Montevideo, as in other Uruguayan cities and, indeed, throughout the "camp" (or country where the farming population resides) the sale of heating and cooking apparatus is becoming increasingly important. In the winter months the temperature is sufficiently low to call for the provision of some artificial warmth, and the summer heats are torrid enough to call for the use of powerful electric fans. The type of house warmer most in demand is the small focusing reflector pattern. A considerable trade is done in this type of heater with the adjacent city of Buenos Aires, where it is manufactured. The same appliance is also furnished with fixtures to provide hot water and to make toast. The Argentine article is not made of very good material, nor is it of attractive design. Cheapness, however, is considered before good quality, and the apparatus sells at prices considerably lower than those asked for similar imported goods. Were it possible to place upon the Uruguayan market a British-made heater at the same price as the Buenos Aires article, there is no question that it would be preferred, since "British made" attached to any article offered for sale in South America becomes a *cachet* of value. In the central station workshops of the Usinas Electrícas del Estado a larger type of heater is made, after designs by one of the State engineers. This type, although little better in quality than that of Argentine origin, has the same advantage of cheapness, since the raw material is obtained locally and the finished product is not called upon to pay either import duties or freight. The demand for this heater has not, however, been as extensive as was hoped. Consumers usually prefer to pay a rather higher price for a superior foreign article, provided this comes within their means.

Montevideo has long been an attractive market for the sale of cooking ranges. The Usinas Electrícas, which holds a fair stock of these appliances, has no prejudices against foreign-made articles, and allows its customers to make their own choice without attempting to influence their judgment. In the display room are to be found many kinds of ranges—American designs predominating, and German makes coming next—which can be demonstrated to prospective customers. Special rates are quoted for domestic supplies. The most popular ranges are fitted with four plates, but there are no ovens, these best meeting the peculiar conditions of Uruguayan households. In view of the heating element being more liable to damage when exposed, a form of profective covering must always be provided.

The voltage is 220, but in ranges thus fitted it has been found that the breakage ratio is higher than in connection with a voltage of 110. In these circumstances the free allowance of renewal parts is always found advantageous. In order to encourage the further use

of cooking ranges in the City of Montevideo, the central station charges only four centesimos per kWh for the first 2,000 kWh consumed, and 2 centesimos for each kWh above that quantity.

An increasing sale for other heating devices, such as flat irons, bread toasters, curling tongs, and immersion heaters has lately been reported. Water-heaters of sufficient capacity for general household purposes have an extensive sale in the "camp." Since few Uruguayan houses are equipped with a hot-water storage tank, there is also a demand for the instantaneous type.

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

The Æsthetic Aspect of Advertisements.

I was more than gratified to read in to-day's REVIEW Mr. Twigg's answer to my letter, and in view of the great interest which the competition must of necessity attract to your advertising pages, perhaps you will permit me to answer not only Mr. Twigg's gentle impeachment of my irrelevance, but to meet him on his own ground, or rather that plot to which he has carried his defences.

In your correspondent's opening paragraph in his letter of September 26th, he refers to "Advertising Street," by which I judge he means the advertising world of to-day; in fact, he develops this theme, and makes the significant statement that "some hurry through without stopping—these are wise." One might justifiably assume that Mr. Twigg is not satisfied with modern advertising, charging it with vulgarity, exaggeration, and irrelevance, to say nothing of theft from the masters of our tongue.

Now to come to the æsthetic aspect—dare your correspondent suggest that modern advertising does not pay? Surely the capacity for a return on money expended is the standard by which a commercial effort must be judged. It does pay, because it is a young craft evolved from bitter practical experience, proved, and successful.

Why, therefore, should we be æsthetic, why artistic? What better criterions can we follow than those demanded in your competition, in which artistic qualities come a very definite last? We at any rate who are concerned with the prosaic manufacturing branch of the electrical industry on its publicity side have a definite duty to perform—to echo our firm's reputation and policy, to give to the purchaser our firm's message as if it emanated from a solid British concern, not a Chelsea studio. In our factories we do not lay Persian carpets in our foundries, or fit our lathes with gold tassels, but, to abandon an exaggerated simile, we build machinery for efficiency and life in Great Britain and not for beauty.

Can Mr. Twigg tell us why we should not convey these ideas in our advertisements, and why we should not first of all concentrate on:

(1) Power of immediate attraction,
(2) Qualities compelling continued attraction,
(3) Boldness of design,

with "artistic arrangement," a fourth desideratum capable of interpretation in its widest meaning—"neatness"?

I cannot fight a worthy opponent from the shield of a pseudonym, and therefore beg to subscribe myself—

J. P. F. G. Turner
(ADVERTISER).

Liverpool, *October 30th*, 1925.

Non-Dazzle Car Lighting.

Many years ago the following experiment was made:—A very bright electric lamp was suspended without any reflector, or shade, from the roof of a large building, the walls and roof of which were very dirty, and the pupil of the eye of an observer was measured. Then, without making any other alteration except placing a large white disk behind the lamp, the pupil of the eye of the observer was again measured. In the second case, although a larger amount of light was falling on the pupil of the eye of the observer, the pupil was larger, showing that there was less strain on the observer's eye. Would not the dazzle of a motor-car's lamps be reduced if the motor-car itself were made visible to the observer by allowing some of the light to illuminate the motor-car?

Experiments in this direction might lead to useful results.

Non-dazzle.

October 26th, 1925.

Combustion Engineers.

I have been interested of late in the advertisements appearing in your columns under the heading of combustion engineers, and am surprised at the amount of salary offered for such positions.

A combustion engineer must be thoroughly proficient in all power plant problems; he is, or should be, entrusted with the handling of the largest item of expenditure in any power station, *viz.*, the fuel; and he can often effect economies covering many times the salary paid. And yet supply authorities place this class of engineer in the lowest grade. Perhaps these authorities and their managers do not yet realise that there is something more in combustion than merely carrying out a few tests.

American power plant managers are, however, realising this, and in many instances the combustion engineer is among the highest paid officials.

Combustion.

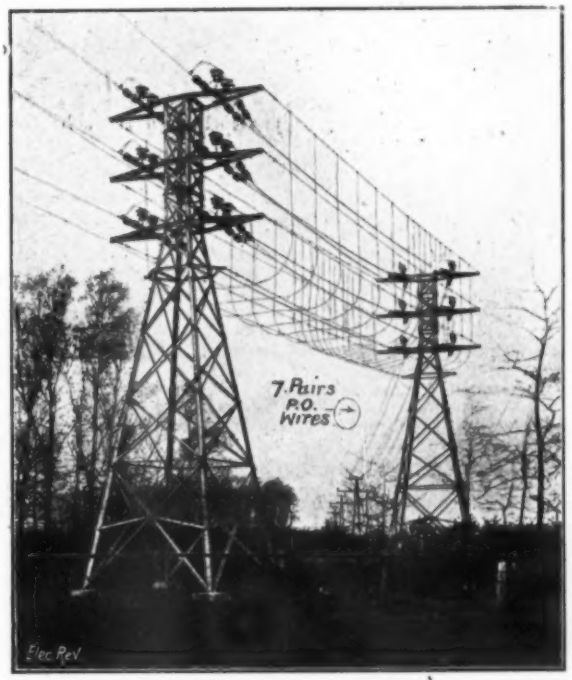
London, *October 30th*, 1925.

Rural Electricity Supply.

It is quite true I am not that kind of "big man" who would subside immediately Mr. Bartholomew ordered him to do so. This is the typical "I have spoken" attitude of the Post Office which we are out to combat.

Mr. Bartholomew's simile of St. George and the Dragon is excellent. He has produced the exact picture of the situation. We must slay the dragons of unreasonable rules and regulations which are neutralising our efforts to be useful. I do not think anything I have written could hurt the feelings of the higher officials now I know that Mr. Bartholomew shyly and wisely disclaims any certain right to be one of their number. They cannot possibly read the ELECTRICAL REVIEW; if they did T.E. 80 and similar concoctions would not exist in their present unreasonable form, and I would have nothing to write about. Unless Mr. Bartholomew seeks audience with them and "tells on me" they will never know!

The short answer to Mr. Bartholomew's belated indignation as to my use of the word "paltry" in connection with short



Power Lines Crossing Telephone Lines.

exchange interconnection lines is the enclosed photo of an actual crossing recently erected by the North Wales Power Co., over this same Northwich to Winsford local line. This is a cheaper design than the one submitted to me officially as that approved, but it is "accepted" as a sort of concession. It costs about £250. We are, in effect, asked to plant two more of these monstrosities on an innocent and hitherto smiling countryside. Your readers will now be able to decide if the Post Office line is a "paltry" thing to have required this fearsome structure, designed apparently to cope with elephants in bulk rather than electricity. Underneath is the Post Office line. It would need a great deal of exaggeration to make it reasonably visible; in fact, it has failed to affect the plate. There are seven pairs of very thin 'phone wires passing where I have indicated by a ring.

I am sorry that Mr. Bartholomew's description of the heavy thinking which goes on in connection with these projects leaves us to seek further for an explanation. I have just remembered that our proposals to cross were dealt with in the holiday season; perhaps the office boy had to deal with them. Seriously, look at the picture and remember that I saw about 1¼ miles of this 'phone line put underground about 18 months ago. One trembles to think what would have happened to our Winsford calls if a few yards more had been laid underground by mistake! It would be laughable if it were not so serious.

Mr. Bartholomew, being a "big" man, has run away from my challenge to produce figures to support the Post Office

refusal to put this line underground at our cost. I tried hard to get them before this discussion arose. The longer the figures are kept back the more the suspicion grows that there are no figures; that the line could be put underground, and that all that prevents it is an old order that this line is to be overhead in the country. The order was made, I suggest, on the ground that the line is too paltry to be put underground in the country on the score of cost, and that as we are prepared to pay it is merely inertia and indifference which stand in our way.

I suggest that Mr. Bartholomew makes too much of the generosity of the Post Office in putting subscribers' lines underground *at our cost*. It is their well-known policy to get them underground, even at their own cost, as soon as they can. I expect they would be glad if we asked and paid for them all to be put underground forthwith!

I am hoping that crossings such as that illustrated will not be required in future, unless the Electricity Commissioners are convinced that no alternative is possible. I even suggest that the Commissioners should take the initiative and scrutinise proposed crossings when proposals are put forward, to see that money is not wasted in unnecessary elaboration. After all, these transmission lines may be purchased later on by a Joint Authority, and the public will then have to foot the bill. If the Commissioners do not exercise the necessary scrutiny, this can be assured by an appeal under the Electric Lighting Clauses Act, 1899. The Commissioners have power to decide whether a requirement of the Post Office is reasonable or not, and may decide what shall be done.

Mr. Hunt, of Haywards Heath, exposes the Post Office "second comer" injustice very neatly. His belief that P.B.J. (allowed in practice for the last 10 years or so with excellent results) will help him on low-pressure a.c. crossings is to have a rude shock. Post Office officials have just dug up a forgotten clause in T.E.80 which forbids it for a.c. exceeding 125 volts, and the word has gone round that T.E.80 must now be enforced. This means that a.c. overhead distribution is killed—unless we appeal to the Commissioners.

I envy Mr. Hunt his sectional engineer who will stretch a point, but I am sorry he has mentioned it publicly as someone may report the statement at headquarters. The whole system of Post Office organisation is contrary to any such thing as elasticity.

Mr. Walker's excellent letter hits the supply engineer very hard, and rightly so. We have no right to make freak rules, as uniformity is as necessary in this as in periodicity and voltage. The electrical industry seems to exercise an uncanny fascination upon all concerned, and some who are not, to make rules.

If you have spare space perhaps you will publish the annexed extract from the new Mid-Cheshire Conditions of Supply:—

> Wiring must be carried out in accordance with the Institution of Electrical Engineers' wiring rules; the 1917 edition is accepted by the company.
>
> *Note.*—Unsatisfactory installation work is a source of expense and annoyance to all concerned. The company is prepared to carry out installation work on request, at the cost of the consumer. Consumers may, however, employ any wiring contractor, but it is suggested that only firms of good standing, who are on the National Register of Electrical Installation Contractors, should be employed. The tests carried out by the company before connection are solely for the purpose of ascertaining the leakage and compliance or otherwise with the statutory requirements.

The rest of the conditions merely recite the legal position as to services, meters, connection, and disconnection. Your readers will note that we accept the 1917 I.E.E. rules and recommend employing only registered contractors. The latest I.E.E. rules are far too elaborate, and we want to help consumers, rather than frighten them.

Northwich, *October 29th*, 1925. **W. Fennell.**

Is the Contracting Business Degenerating?

In agreement with "Contractor's" and "Ghost's" letters published last week concerning examinations for wiremen, &c., may I suggest that until such time as these become compulsory, employers should take into consideration when employing men that there are some who pay substantial fees and devote their spare time to gaining technical knowledge, either through the I.C.S. or other institutes.

It must be admitted that by doing this the men are proving their interest and willingness to learn their trade, else why should they take the trouble and pay the fees when others who don't trouble or care, but simply bluff through, are enjoying their leisure?

Not only in civil life do some trades demand a minimum efficiency, but, in the Services, trade tests are in force, and the result is that the best men go forward and leave the duds behind—not as it is to-day in most cases when the good workman has to carry the bad one with him.

Wireman.

London, *October 26th*, 1925.

I would just like to break in on the discussion of the trials of wiring contractors and the recrudescence of the "Diplomas for Wiremen" idea.

Now, whilst there undoubtedly is such an individual as the "Jerry Wireman," the jerry wiring contractor also exists, and to those engaged in the industry who seek foes to conquer I would say that he is the greater enemy. He is the man who cuts your price with cheap and nasty 1/18, who runs "umpteen" wires in tube where you would have provided an easy draw-in. Some of his under-the-floor jobs seem to say "Oh where, oh where, has that little tube gone?"

In a long experience the writer has found more trouble and breakdowns traceable to the unscrupulous contractor than to the bad workman.

Do not leave him to his own funeral; he is cutting your price all the time. He may be that jerry wireman you sacked last week, he may be a grocer or a candlestick-maker, who cares?—but the house he wires may be burnt out next week.

Then for the good of the industry let us have registered contractors first, and maybe the jerry wireman will go along with the jerry wiring contractor, wherever that may be.

Oh yes, I know that registered contractors do exist, but I am asking for a scheme which shall include every electrical contractor.

The support fire insurance companies, supply authorities and the like, should give such a scheme would make it practically compulsory for a contractor to be registered, and the fear of loss of registration would be an effectual safeguard against the kind of work put in sometimes, by the plumber, the ironmonger, or the local radio stores.

H. Verrall.

London, *October 28th*, 1925.

Mr. E. O. Walker's communication of the 14th inst. draws attention to many anomalies which hinder the progress of electrical installation work on an economical basis as compared with gas. At the same time, while one must agree with him regarding the general absence of accidents with electrical fittings, I would suggest that it would be absolutely fatal to the future of the industry to allow any slackening of the regulations. A lot of "shoddy" wiring jobs are done now, and any attempt to modify the rules in the direction indicated will only tend to increase this kind of work. We want an installation to possess safety and reliability after years of service and this without expensive maintenance and renewal of fittings.

Do not let us be led away by a desire to revise the wiring rules in order to permit of greater laxity in safety measures. Let us turn our attention to a crusade for the more stringent regulation of gas. As Mr. Walker points out, how often does one read of fatal results due to gas leakage from defective pipes. Only a few days ago, a Manchester innkeeper was asphyxiated in his own electrically lighted premises by a leakage from a large gas main running under the pavement outside. According to published accounts, the gas department merely explained that the main was laid several years previously and no tests had since been made to determine its condition. Further, it would appear that there was not any test, short of pulling up the ground, which would indicate the whereabouts or even existence of any leakage. What a confession to make. Are there no regulations governing gas supply? If not, then it would appear time that the standard was raised to that at which we aim in electricity supply.

Touching on the penultimate paragraph of Mr. Walker's letter and also on the remarks of some other correspondents, it is not always the odd job wireman who is in the picture. One has only to glance at published lists of tenders submitted by reputable and registered electrical contractors to discover an amazing difference between the prices. Especially is this noticeable in the case of a large institution contract, where, presumably, there is the same specification to meet and a consulting engineer to satisfy. One can only draw one conclusion—shoddy work which initially just passes the rules.

"Ghost" refers to "popularising electricity." Popular handbooks on "how to do this and that," and cheap correspondence schools, have made many electricians (!) for a few shillings, and the tragedy is that the non-technical public believes it. Electricity is a side line with plumbers, watchmakers, stationery and fancy goods dealers, &c., and people will employ these where on the other hand they would not dream of consulting anybody except a registered medical man, licensed dentist, or a chartered accountant for their other affairs. Why? Because a non-trained individual would be prohibited from practice in the latter professions and the respective associations would see to it. It is up to us to put the electrical engineer on the same footing and then, and only then, shall we get electrical work properly done.

W. T. Critcher,
A.M.I.E.E., Assoc.M.C.T.

Swinton, *October 26th*, 1925.

[This letter has been abbreviated.—Eds. Elec. Rev.]

Waste Heat from Steam-driven Stations.

The chairman's address to the South Midland Centre of the I.E.E. says that no remedy is forthcoming for the waste of heat by steam-driven stations on a large scale.

I have repeatedly suggested that most effective use can be made of it to stimulate crop growth. The warm water can be used in open channel irrigation, or passed through a grid of buried pipes.

The new sugar industry is a good field for trial. Probably two or three crops of sugar beet could be raised per annum, instead of one, which would improve the present low annual load factor of the refinery. The refinery itself is a good customer for waste heat, at the times when the crop is off the ground.

This is an example. Other crops may pay as well or better, especially early market garden stuff, and, with the assistance of glass, grapes, tomatoes and the like.

I believe there is no other general application of low-temperature heat which can give so good a return.

Experiments on a small scale would not be very costly, and should investigate the questions of fertilisers and other matters, arising from working the soil harder.

Henry M. Sayers.

London, *November 1st*, 1925.

Motor Converters v. Rotary Converters.

The subject of motor converters v. rotary converters is one that interests me greatly, and as I am in favour of the former I venture to reply to Mr. Wüthrich's remarks.

Taking the points in the order that he gives them:—

1. I agree entirely with his first statement that it is an advantage to have a separate transformer; incidentally, most modern power systems work at higher voltages than 11,000 V, so the motor converter would be no different here to the rotary.
2. I have frequently started up rotaries and induction motors (the a.c. side of a motor converter), and of the two I think the induction motor is considerably easier. Most people will, I am sure, agree with me.
3. At full load the rotary is certainly far more efficient, but at about ½ to ¾ load there is but little difference, and this is usually about the working load. I agree that the two forms of converter are equal as regards power factor correction.
4. Mr. Wüthrich admits that the rotary is inherently inferior to the motor converter as regards d.c. regulation, but suggests using an induction regulator. Admitting that the efficiency is still higher—which I doubt—induction regulators for large-sized machines are too big and costly to be of much use, otherwise why aren't they more often used?
5. Here I am in agreement.
6. This Mr. Wüthrich dismisses practically by saying that it is a "small reduction in peripheral speed"! Does he consider 50 per cent. small? The wear and tear on bearings must of necessity be less; while on the d.c. side the motor converter is practically immune from flash-over on sudden overload, a thing far from rare on a traction rotary. In fact traction rotaries of 50 cycles, 1,500 r.p.m., 1,500 V, are, to the best of my belief, not manufactured in this country; and in the States, where they are made, I believe the commutator looks like a ploughed field.
7. This is practically a repetition of No. 2, and if an induction regulator is inserted with the rotary then certainly the motor converter is the easier to handle.

As regards space the rotary "has it every time." To state that the design of a rotary is easier surprises me. Surely there is no difference. The mere fact of passing leads from one part of the machine to the other does not strike me as a complication.

Finally, with regard to manufacture, I believe I am right in saying that until recently only one firm in this country held the patent rights of manufacture. These expired lately, and as soon as they did so at least one other well-known firm started to manufacture La Cour motor converters.

H. A. Sieveking (B.Sc.).

Rugby, *October 30th*, 1925.

Mr. Wüthrich, in his letter appearing in the current issue of your paper, once again raises this time-honoured controversy, and makes comparisons which would appear to suggest that the firm with which he is connected does not build motor converters, and that he is perturbed by the steadily increasing demand for these machines.

The various arguments which he puts forward have been fully answered in previous discussions, and he has evidently overlooked the fact that it was only after the British master patent expired a few years ago that motor converters could be manufactured in Great Britain by other than one company; and the additional firms who are now building these machines are just those who have had the most extensive and successful experience in the manufacture of rotary converters.

I would like to point out two errors in Mr. Wüthrich's letter:—

(*a*) He states that the full load efficiency of a 1,000-kW motor converter is about 89.5 per cent., whereas the efficiency of such a machine is actually 93 per cent., which is the same figure as he claims for a rotary converter of this size with series reactance.

(*b*) He says: "The leads connecting the two rotor windings have to be led through the hollow shaft and middle bearing, this being a rather weak point, from a constructional point of view."

This is perfectly true with the old 3-bearing machine, but motor converters of modern design are built with only two bearings, and consequently his criticism does not apply.

The motor converter has steadily increased in favour since it was first introduced into this country, and its present popularity is neither a fad nor a fashion, as Mr. Wüthrich suggests, but is due to its proved merits.

As the firm with which I am associated equally manufactures motor converters and rotary converters, I am perhaps in a position to take a more disinterested view than is possible with your correspondent.

John H. Bunting.

London, *October 31st*, 1925.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

Our Telephone Number.—The telephone number of the ELECTRICAL REVIEW (all departments) has been changed to "Central 7072" (three lines).

E.C.A. Conference, 1926.—It is announced in the *Electrical Contractor* (the official organ of the E.C.A.), that the first annual conference of the E.C.A. Allied Organisations will be held in Brighton during the summer of 1926. The proposal was unanimously adopted by the Council at its meeting on October 21st. The matter came forward in the form of a resolution from the Western Section that an annual summer Convention or Conference extending over two days should be held. The various branches and members are to be notified at the earliest possible moment.

Difficulties of German Electrical Companies.—In its report for the year 1924-25, the Isaria Meter Works Co., of Munich, stated that trade activity was generally favourable, and in some departments overtime had to be worked, but the net profits of 31,000 marks did not permit of the distribution of a dividend, the reason for this being that selling prices, particularly for meters, were too low. Since the beginning of the new financial year, however, prices have advanced, and are gradually approaching the level of the former peace-time rates. The report of Brown, Boveri & Co., of Mannheim, for 1924, states that orders received showed a considerable falling off in the second half of the year. They were in many cases only obtained at prices which yielded no profits and often resulted in a loss. Since the beginning of the year, wages increased by 60 per cent. Differences of a few per cent. in the costs of production were a determining factor in the matter of the competitive capacity of the industry in the home and foreign markets. The burden of taxation prevented the operation of the undertakings on a basis which promised a regulated and moderate return, and it hindered competitive capability in the world's markets. The liquidation of transactions dating from the period of the inflation continued to burden the year's working, and would only be completed in 1925. Notwithstanding all these difficulties, the departments made satisfactory progress; it had been found possible systematically to simplify and further improve production. The accounts for 1924 show a loss of 141,000 marks. At the recent annual meeting it was stated that orders during 1925 have been satisfactory, and will provide employment for some time, although selling prices still leave something to be desired.

Depression in the Rhine Provinces.—The *Times Trade and Engineering Supplement* states that industrial conditions in the Rhine Provinces are weekly becoming more serious. In the iron and steel industries employés are being thrown out of work by the closing down of factories. One electrical works has closed down and dismissed all its employés.

A Trade Forecast.—In the forecast of the Federation of British Industries, published in its organ, *British Industry*, it is stated:—"There are fairly definite signs that the lull in world trade which, in accordance with our previous forecast, prevailed throughout the last quarter, is coming to an end, and that a new period of expanding trade is about to begin. This movement, which is primarily seasonal in character, received considerable encouragement from the change over to a policy of cheap money and plentiful credit which occurred in August, followed by a subsequent further reduction of the Bank Rate on October 1st. If some official assurance could be obtained that the present monetary policy is to be persisted in, this movement might easily reach substantial dimensions, especially if the inflationary tendencies already at work in America remain unchecked. Unfortunately, the recent weakness in our exchange, coupled with the heavy outflow of gold, amounting to nearly £7,000,000 during the first three weeks of this month, introduces the possibility of a reversion to a higher Bank Rate during the next few weeks; but such a change would imply miscalculation. Much will also depend on the policy pursued by the New York Federal Reserve Board. There are, however, as yet no signs of the removal of the embargo on foreign investment; and our labour costs are not yet adjusted to our exchange."

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Support for the E.D.A.—The Electricity Committee of Exeter City Council has resolved to contribute ten guineas per annum to the British Electrical Development Association.

Local Exhibitions. — GLASGOW. — A radio exhibition organised by Consulting and Radio Service, Ltd., was opened at 15, Gordon Street, on October 31st, by Sir R. Wilson. The exhibitors include the Western Electric Co., Ltd., the General Electric Co., Ltd., Burndept Wireless, Ltd., the Marconiphone Co., Ltd., the British Thomson-Houston Co., Ltd., the British Radio Corporation, Metro-Vick Supplies, Ltd., the Radio Communication Co., Ltd., Messrs. Cahill & Co., Ltd., and Messrs. S. G. Brown, Ltd.

ELLAND.—An exhibition of electrical appliances, principally domestic, was opened on October 26th, by Mr. W. B. Woodhouse, general manager of the Yorkshire Electric Power Co. The Elland electricity undertaking was established in 1903, but in 1921 local generation was stopped and supply has since been obtained in bulk from the Yorkshire Electric Power Co.

BURNLEY.—We are informed by the borough electrical engineer (Mr. J. E. Starkie) that the Electricity Committee is planning an exhibition on a large scale to be held about the end of January next.

A "Siemens" Sign.—A striking illuminated neon sign of approximately 1,000 candle power, measuring 10 ft. by 2½ ft., representing the trade mark "Siemens," has recently been fixed above the facia of the Siemens & English Electric Lamp Co., Ltd.'s premises at 38-39, Upper Thames Street, E.C.4.

A Siemens Neon-Tube Sign.

The light given is very distinctive and peculiarly attractive. When illuminated the sign is quite a landmark and can easily be seen from the Blackfriars end of Upper Thames Street on the one hand and from Cannon Street Station on the other. We reproduce herewith a photograph of the sign.

Trade Announcements.—THE MARCONIPHONE CO., LTD., whose head office is now 210-212, Tottenham Court Road, London, W.1, has lately opened a number of new branches in various parts of the country, to facilitate distribution of its products. In addition to the branches stated in the company's recent advertisements it has opened others at Southampton (81a, Above Bar); at Leeds (15, Wellington Street); and at Liverpool (1, Oriel Close, Water Street).

MESSRS. AUSTIN WALTERS & SON, LTD., have appointed Messrs. S. G. Leach & Co., Ltd., 26-30, Artillery Lane, E.C., as their sole agents for London and the South of England, and export.

Mr. J. C. WHITE, of Manchester, has installed an additional telephone line; the numbers now are: Central 1090 and 1091.

THE MULLARD WIRELESS SERVICE CO., LTD., has opened a depôt at 30, Handyside Arcade, Percy Street, Newcastle-on-Tyne, under the management of Mr. F. F. Turner. Stocks are carried.

MR. CHARLES CLOUT, electrical and radio engineer, 134-5, Snargate Street, and Worthington Street, Dover, has opened new premises at 1 and 2, Priory Place, in that town.

THE COUNTY ELECTRICAL & WIRELESS STORES, LTD., of 2-3, Norfolk Street, Strand, London, has removed its business at Folkestone to larger premises at 124, Sandgate Road.

THE FOSTER ENGINEERING CO., LTD., has opened an additional office and stores for the trade at 37, South Castle Street, Liverpool, for the sale of "Apex" ironclad switchgear, "Foster" transformers, "Crown" cable and wires, &c., and electrical accessories. Mr. G. S. Williams has been appointed manager of the branch.

THE ENGLISH ELECTRIC CO., LTD., announces that instead of treating the Manchester, Bradford, Sheffield and Liverpool districts as four distinct sales areas, each controlled by a separate branch office, it is combining them so as to form a "Northern Area" with headquarters at 196, Deansgate, Manchester, under the direction of Mr. P. H. Symonds, M.I.Mech.E., A.M.I.E.E., who has been appointed Northern area sales manager for the company. The existing offices at Bradford, Sheffield and Liverpool, will be maintained as subsidiary offices and will continue to deal with the company's business in their respective districts.

MESSRS. CLARKE & PITCHER, electricians, have opened new premises at 10a, Dover Road, Folkestone.

Catalogues and Lists.—THE STERLING VARNISH CO., 196, Deansgate, Manchester.—A pamphlet advertising the firm's insulating varnishes.

SIMPLEX CONDUITS, LTD., Garrison Lane, Birmingham.—A comprehensive catalogue (96 pp.) of "Simplex" conduits and conduit fittings. Fully illustrated and priced.

METRO-VICK SUPPLIES, LTD., Trafford Park, Manchester.—An illustrated booklet entitled "The Hospitality of Light," presenting the case for electric lighting generally—and by "Cosmos" lamps in particular.

THE MARCONIPHONE CO., LTD., 210-212, Tottenham Court Road, W.1.—Three well-illustrated and priced catalogues dealing respectively with "Marconiphone" and "Sterling" radio apparatus, and "Marconi" valves.

MESSRS. HERBERT MORRIS, LTD., Loughborough.—Book 105, containing particulars of the Morris gravity conveyor, &c.

THE MIDLAND ACCUMULATOR CO., 47, Newhall Hill Parade, Birmingham.—A priced pamphlet giving details of the firm's accumulators for radio work.

TOK SWITCHES, LTD., Granville House, Arundel Street, W.C.2.—November blotter illustrating rotary snap switches.

THE BRITISH THOMSON-HOUSTON CO., LTD., Crown House, Aldwych, W.C.2.—Pamphlet L356, describing "Mazda" electric decoration lamp outfits for shop windows, Christmas trees, &c.

DELCO-REMY & HYATT, LTD., 111, Grosvenor Road, S.W.1.—A series of slips containing information relating to the company's bearings, mine-tub wheels, belting, thermostats, and starting, lighting and ignition apparatus.

MESSRS. AUSTIN WALTERS & SON, LTD., Little Peter Street, Manchester.—An illustrated and priced catalogue of electric signs, containing views of actual installations.

THE JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, S.W.1.—A calendar-blotter for November, illustrating one of the firm's fires.

ELECTRICITY SERVICES, LTD., 27, Martin Lane, Cannon Street, E.C.4.—A pamphlet dealing with good illumination and advertising the firm's installation-maintenance service.

MESSRS. JOHN BENNIE, LTD., Moncur Street, Glasgow.—A leaflet illustrating examples of the company's electric and other lifts.

MESSRS. GARNETT, WHITELEY & CO., LTD., "Lotus Works," Broadgreen Road, Liverpool.—A coloured showcard advertising "Lotus" vernier coil holders. Priced.

MESSRS. ALFRED HERBERT, LTD., Coventry.—A pamphlet dealing with pulverised fuel for boiler firing in the paper industry.

THE IGRANIC ELECTRIC CO., LTD., 149, Queen Victoria Street, E.C.4.—A booklet giving details and prices of "Igranic" radio accessories generally, and a series of leaflets dealing with particular components.

Bankruptcy Proceedings.—W. R. J. WHITE, electrical agent, 29, Great Pulteney Street, W.—This bankrupt applied, on October 27th, to Mr. Registrar Mellor at the London Bankruptcy Court for an order of discharge. The Official Receiver reported that the bankrupt failed in September, 1922, with liabilities of £1,151; the assets realised £131, and a first and final dividend of 1s. 5½d. in the £ was paid. The bankrupt commenced business in October, 1920, and carried it on with various partners. He attributed his failure to depreciation in the value of his investments. The application was opposed on the ground of rash and hazardous speculations and unjustifiable extravagance in living. A discharge was granted, subject to a judgment for £50 to be satisfied by an immediate cash payment.

S. S. SCHREIBER, dealer in electric lamps and accessories, 175, Great Portland Street, W.—This debtor was made bankrupt in May last on the petition of the British Thomson-Houston Co., Ltd., his only liability being £131 in respect of costs of an injunction restraining him from infringing the company's patents. He applied on October 27th to Mr. Registrar Mellor, at the London Bankruptcy Court, for an order of discharge, when the Official Receiver reported insufficiency of assets to equal 10s. in the £ on the amount of the liabilities, and omission to keep proper books of account. After hearing Mr. A. W. Horsell, in support of the application, his Honour granted a discharge subject to judgment for £20 to be satisfied by an immediate cash payment.

W. R. BALL and H. J. LEECH, trading as R. Ball & Company, electrical engineers, 287, Upper Street, Islington.—The public examination of these debtors was held recently. The accounts showed liabilities of £2,328 (unsecured £2,230), and assets "cash in hands of Sheriff," £20 17s. Replying to Mr. F. Vyvyan, Official Receiver, the debtor Ball stated that in January, 1922, with £100 capital, he commenced business at the above address as an electrical and mechanical engineer; the debtor Leech joined him as a partner fourteen months later, introducing £200 in cash and machinery in return for a half share of the profits. They subsequently traded as R. Ball & Company, until last March, when their stock, machinery, and furniture, were sold under an execution. In September, 1924, they entered into a contract to supply 15,000 pairs of headphones at the rate of 500 pairs per week. Owing to the late delivery by the manufacturers of certain materials required for the contract, delivery was not made to time, and, in consequence, the contract was cancelled, and in February,

1925, they were sued for breach of contract and judgment was given against them for £369, of which £70 had been paid. The examination was concluded.

H. MCCLELLAND, 12, Leigham Avenue, Streatham Hill, S.W., late 48, Strand, London, radio apparatus merchant.—The first meeting of creditors was held on October 30th, at 29, Russell Square, W.C.1. The statement of affairs showed liabilities of £1,862 and there were no assets. Debtor attributed his failure to lack of capital and bad trade in a partnership business. After being in partnership with another from September, 1919, to July, 1923, his partner retired without receiving any payment, and debtor took over the assets and liabilities. He traded on his own account until August, 1924, when he sold the lease of the premises and a portion of the stock for £250, and out of this sum discharged the greater part of his liabilities. In September, 1924, he entered into verbal partnership with another and they traded as radio apparatus merchants at 48, Strand, W.C., under the style of the X.L.O. Company. He brought the remainder of the stock (about £150) from his previous business to the business. In May, 1925, the second partnership was dissolved, his partner taking over the assets and liabilities without payment to the debtor. Debtor became aware of his position in October, 1924. The case being a summary one, was left with the Official Receiver as trustee of the estate. The following are creditors:—

	£		£
Battersby, Mrs. T.	160	McClelland, J.	1,220
Marconiphone Co., Ltd. ...	110	McClelland, W.	200
Renold, M.	80	Reid, H.	90

W. R. SQUIRE, 11, Steward Street, Spring Hill, Birmingham, electrical engineer.—The first meeting of creditors was held on October 29th at the Official Receiver's offices, Birmingham. The statement of affairs showed ranking liabilities of £68, and a deficiency of £41. Debtor attributed his failure to depreciation in value of stock, bad debts, and trade depression. He commenced business as an electrical engineer at Redditch in 1907, but this was discontinued. In April, 1919, he recommenced business as an electrical engineer at Edgbaston with £140 capital, and in March, 1921, he removed to his present address. The matter was left with the Official Receiver as trustee of the estate.

W. J. LATTIMER, trading as W. J. Lattimer & Co., 52, High Street, Croydon, electrical engineer.—The receiving order in this matter was made recently on a creditor's petition. The statement of affairs shows liabilities of £285 against assets of £11, leaving a deficiency of £274. Debtor attributes his failure to lack of capital and underestimating the cost of contracts carried out. In 1919 debtor commenced business without capital as an electrical contractor, with a shop, where he sold electrical fittings. The shop, however, did not prove profitable and he closed it down in March, 1922, and continued only the contracting business. He became aware of his position in February, 1925, since when most of the present debts have been contracted. The following are creditors:—

	£		£
Emanuel & Sons, Ltd.	25	Electrical Supplies, Ltd.	50
Cysiles, Ltd.	20	Falk, Stadelmann & Co., Ltd.	55
Thomas & Co.	20		

J. MITCHELL and F. MITCHELL (F. Mitchell & Co.), electrical engineers, 97, Stockport Road, Ardwick, and 58, Ashton Old Road, Openshaw, Manchester.—Last day for proofs for dividend, November 14th. Trustee, Mr. J. G. Gibson, Official Receiver, Byrom Street, Manchester.

F. MITCHELL, lately carrying on business with J. Mitchell (F. Mitchell & Co.), electrical engineer, 113, Broom Lane, Levenshulme, Manchester.—First and final dividend of 15s. 0½d. in the £, payable November 9th, at the Official Receiver's offices, Byrom Street, Manchester.

W. K. COXON (Western Manufacturing Co.), wireless apparatus manufacturers, Nurshell, Lydney, Glos.—Receiving order made October 21st, on creditor's petition. First meeting, November 4th, at 34, Park Lane, Cardiff; public examination, December 15th, at the Town Hall, Newport, Mon.

S. PURCELL, electrical contractor, The Arcade, Goole, Yorks.—First meeting, November 3rd, at the Official Receiver's office, 21, King Street, Wakefield; public examination, November 12th, at the Court House, Wakefield.

Company Liquidations.—ISAACSON & BROWN, LTD., electrical engineers, 39, Furnival Street, Holborn, E.C.4.—A meeting of creditors was held on October 24th at 94, Chancery Lane, W.C., when Mr. R. Chudleigh, the liquidator of the company, presented a statement of affairs, which disclosed liabilities of £1,644 and debentures and interest amounting to £562. The assets totalled £11, leaving a deficiency of £2,195. The deficiency account showed that there were trading losses to June 8th, 1923, of £2,053, and for the period from June 8th, 1923, to October 9th last there was a loss of £334. The company was formed in June, 1923, with a nominal capital of £1,000, which, in November, 1919, was increased to £5,000. Debentures were issued in January, 1913, amounting to £800, and on June 8th, 1923, when a receiver was appointed, there was a balance of £775 outstanding. It was stated that in 1916, 1917, and 1918 profits were made, but since then losses had been incurred. The liquidator said that all goods obtained since the appointment of the receiver had been paid for in cash. It was decided that the voluntary liquidation of the company should be continued with the present liquidator.

J. SPRINGER, LTD., 152, Wardour Street, W., and High Wycombe, electrical engineers and kinema furnishers.—A further meeting of creditors was held recently. The meeting was called by Mr. C. B. Holland, C.A., of Messrs. Prideaux, Old Square, Lincolns Inn, W.C., who had been appointed as the liquidator in the voluntary liquidation of the company, for the purpose of considering an offer of approximately 1s. in the £. The creditors passed a resolution agreeing to accept a composition of not less than 2s. in the £.

ELECTRIC LOCOMOTION & FOUNDRY CO., LTD.—A meeting of members is called for December 1st at E. Milburn House, Newcastle-upon-Tyne, to hear an account of the winding up from the liquidator, Mr. T. C. Martin.

ELECTRIC DISTRIBUTING CO., LTD.—Particulars of claims are to be sent to the liquidator, Mr. H. S. Jones, 3, York Street, Manchester, by November 16th.

CONSOLIDATED DIESEL ENGINE MANUFACTURERS, LTD.—Liquidator, Sir W. B. Peat, 11, Ironmonger Lane, released October 26th.

ELECTRIC REPAIRS, LTD.—Meeting of creditors, November 11th, at Imperial Buildings, Bridge Street, Walsall; particulars of claims to the liquidator, Mr. J. T. Bunch, Imperial Buildings, by December 18th.

Dissolutions of Partnership.—BROWN & MASON, electricians, Barn Street, Strathaven, Lanarkshire.—Messrs. W. Brown and H. Mason have dissolved partnership. Mr. Brown will carry on the business at Barn Street, and Mr. Mason at Sun Buildings, Kirk Street.

WARDELL & Co., electrical contractors, 83, Raleigh Road, Richmond, Surrey.—Mr. F. W. Wardell and Mr. J. W. Poultney have dissolved partnership. Debts will be attended to by Mr. Wardell, who will continue the business.

Book Notices.—"Year Book and Diary" (88 pp. and diary pages). Edinburgh: The Electrical Contractors' Association of Scotland. Price 3s.—This contains lists of members and officers of the Central Board and branches, with notes of the Association's activities. In addition there is a great deal of information of service to contractors, including regulations, model tender conditions, legal notes, and organisation details.

"Scientific Paradoxes and Problems." By A. S. E. Ackermann, B.Sc., A.M.Inst.C.E. Pp. viii + 131. London: Old Westminster Press. Price 5s. net.—The author of "Popular Fallacies," having broadcast a series of "talks from 2LO" on that subject, was bombarded with knotty problems and paradoxes, 100 of which are dealt with in this volume. Many of them are strictly genuine physical or dynamical problems, requiring a wide range of scientific information for their solution; others are puzzling only to the layman unfamiliar with elementary mechanics or mathematics, and others, again, are of the "trick" variety, or purely plays upon words and figures—but all are interesting, and it is not easy to put the book down once it is opened. Certainly its publication was well worth while.

"The *Ironmonger* Pocket Book." (64 pp.) London: The *Ironmonger*. Price 1s.—This is a real pocket book, *i.e.*, it is of a convenient size for a pocket, and contains a large number of tables of data relating to tinplates, bolts and nuts, copper, lead, cast-iron, boilers, tanks, belting, and numerous other matters. It also contains a squared-paper notebook.

"Mechanical Testing of Materials." By W. M. Crossman. Pp. 36; 11 figs. London: Association of Engineering and Shipbuilding Draughtsmen. Price 2s.—The author of this pamphlet recognised that a full treatment of the subject was impossible; his aim was to briefly outline the several methods employed in scientific and commercial testing, with the object of creating practical interest in this section of engineering rather than entering into the mathematical aspect of the subject.

"Power Alcohol from Beet." Pp. 16. London: British Power Alcohol Association.

The McGraw-Hill Publishing Co., Ltd., has issued a list of American books on business and economics. Details of the scope of these works and their prices are given.

"The *Journal* of the South African Institution of Engineers." Vol. XXIV, No. 3. October, 1925. Price 2s.

"Scientific Papers of the Institute of Physical and Chemical Research, Tokio, Japan." Vol. 3, No. 37, July, 1925; Nos. 38-40, August, 1925.

"Coils and Magnet Wire." By C. R. Underhill. Pp. xi+494; figs. 197. London: McGraw-Hill Publishing Co., Ltd. Price 20s.

"The Mathematical Theory of Electricity and Magnetism." By J. H. Jeans. Pp. viii+652; figs. 139. Cambridge University Press. Price 21s. net.

"Behind the Counter." A practical guide for shop assistants. By W. H. Beable. Pp. 102. London: Simpkin, Marshall, Hamilton, Kent & Co., Ltd. Price 3s. 6d. net.

"Anniversary Volume of Voluntary Contributions," dedicated to Prof. Hantaro Nagaoka, on the completion of 35 years' professorship at the Tokio Imperial University. Tokio, 1925.

Electrical Goods for Brazil.—A slight improvement is recorded in exports of British electrical goods to Brazil. A recent monthly consignment from the United Kingdom consisted of 10 metric tons (164 cases of mixed goods), compared with 36 metric tons (2,064 cases) from the United States, and 27 metric tons (227 cases) from Germany.—*Reuter's Trade Service* (Rio de Janeiro).

New Belgian Companies.—Among the recently-formed Belgian companies are the following:—Les Etablissements Edouard George et Cie. (Brussels, capital 250,000 fr.), for the manufacture and sale of heating, electrical, telephone, and radio apparatus, &c. Constructions Electriques Marelli (Brussels, capital 800,000 fr.), for the sale and, later, manufacture in Belgium of electrical machinery. Electricité de la Lesse (Anseremme-lez-Dinant, capital 300,000 fr.), for the supply of electricity for all public and private purposes. Ateliers E.-R. Lataire Frères (Eecloo, capital 1¼ million fr.), for the production, *inter alia*, of electric motors and speed-reduction apparatus. La Cuivrerie Liégeoise (Liége, capital 225,000 fr.), for the manufacture and sale of lighting glassware and electro-technical apparatus.

Lead.—Messrs. James Forster & Co. on October 31st stated:—"Supplies are coming in steadily, and there is no shortage of prompt lead. A scarcity is now predicted for next month, but, as this was said of October, we do not attach much importance to it. With the shipping strike collapsing in Australia, the prospect is for full supplies and, if consumers continue to hold off the market, this can only result in lower prices."

The New Southport Showrooms.—In our last issue we reported that the new municipal electricity showrooms and offices at Southport were recently opened. We have now received a number of photographs of the new premises from the borough electrical engineer (Mr. E. Moxon); three of these views are reproduced herewith. The first shows the exterior of the building, which is situated in a far better position than the Department's old offices. The premises were formerly a skating rink. Fig. 2 is a view of one of the principal rooms, and shows a number of electrical appliances, including an ironer, several types of fires, a vacuum cleaner, and an electrically-driven sewing machine, as well as various kinds of lighting fittings. The third illustration is of the demonstration room. This is equipped with tip-up seats and a *dais*, on which are mounted cookers and other kitchen requisites, which can be shown in action to prospective users.

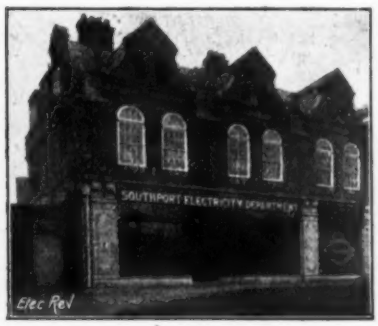

Fig. 1.—Exterior.

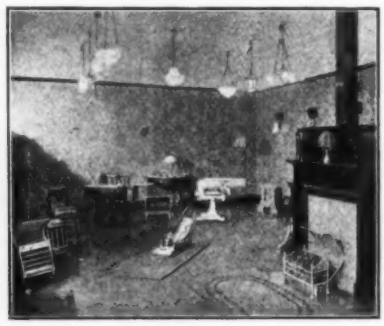

Fig. 2.—One of the Main Rooms.

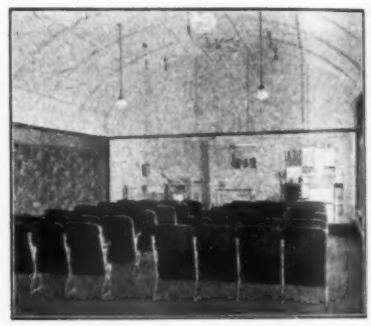

Fig. 3.—The Demonstration Room.

The New Southport Showrooms.

The New North Wales Company.—With reference to the new company named "Electricity Distribution of North Wales and District, Ltd.," the registration of which was announced in some detail on page 706 of our last issue, we understand that this company will operate under statutory powers and distribute in detail electric supplies in a number of towns in North Wales, including Denbigh, St. Asaph, Flint, Holywell, Rhuddlan, Sandbach, Alsager, Pwllheli, Wrexham Rural District, Abergele, Criccieth, Nantwich, and the surrounding districts representing an area with a population of some 300,000. Supplies of electricity will be derived in bulk from the North Wales Power Co., which owns hydro-electric stations in the Snowdon and Carnedd Llewellyn districts of North Wales, and whose system of transmission lines already substantially extends from Carnarvon Bay to Crewe. The expenditure on the initial programme is estimated at some £200,000, all of which has already been provided for. The directors include Messrs. H. J. Jack, A. F. Bott, R. F. Legge, and G. V. Twiss. Mr. E. C. Heymer is the secretary, and the registered offices are at Wellington House, Buckingham Gate, S.W.1. The Power Development Co., Ltd., of 25, Victoria Street, which has been concerned in the formation of the company, is acting as engineers. Mr. G. V. Twiss, who has founded the Power Development Co., Ltd., has merged with it the organisation of the consulting business of G. V. Twiss & Co., and has moved to offices at 25, Victoria Street, S.W.1. (Telephone Nos.: "Victoria 4544 and 4545.")

A Large Floating Crane.—The *Morning Post* reports that the Port of London Authority has decided to place a contract with Messrs. Cowans, Sheldon & Co., Ltd., Carlisle, for the construction of a floating crane capable of lifting weights up to 150 tons. The largest of the Authority's existing cranes is only intended for a maximum load of 50 tons. The crane will be self-propelling, the driving engines being steam-driven, while the actual crane power will be electrical.

Strike at Wire Works.—Last week over 200 wire drawers employed by Messrs. Richard Johnson & Nephew ceased work owing to differences as to the distribution of work among the hands.

Large British Contracts.—Among the important contracts recently awarded to British firms the following may be mentioned:—The English Electric Co., Ltd.: Forty large railway motors for the Southern Railway, and five electric locomotives for the Montreal Harbour Board. Westinghouse Brake and Saxby Signal Co., Ltd.: Power signalling apparatus for Charing Cross and Cannon Street stations (Southern Railway). Henry Simon, Ltd.: An electrically-operated pneumatic coal-handling equipment (25 tons per hour), for a London brewing firm.

British and Continental Cable Prices.—A discussion arose at a meeting of the Accrington Town Council recently, when it was reported that the Continental quotation for 1,000 yards of main cable was nearly one-third less than the British on a contract of £600, while the cable was guaranteed to be as good as the British. Alderman Higham, chairman of the Electricity Committee, said it had been suggested to ask the members of the Cable Makers' Association to accept a lower figure. Personally he would like to keep the order in this country, because he believed in finding employment for our workpeople, but his fiscal doctrine led him to favour the purchase in the cheapest market. He would like the opinion of the Council. It was not a matter of one small contract, for this year Accrington had spent over £10,000 on cables, and they wanted to settle the policy once and for all. In the course of the discussion one speaker said that how the Continental goods were produced as compared with the British was an important consideration and Mr. Higham said they would try to obtain information as to hours and wages for the Continental product. A later speaker remarked that the question affected all municipalities, and he suggested that Corporations should amalgamate and try to secure a re-adjustment of prices. Councillor Slack thought it better to leave the matter with the Committee for the present. Mr. Roberts said it would be too late to protest after the order had been given. As a trade unionist, he would object to any order, however cheap, if trade union conditions were not observed. Other speakers wanted the order to remain here to prevent our men being thrown on the streets, but wanted to stamp out consultation between firms before tendering. Alderman Barlow said the Council must not overlook the question of quality. The British cable test was a very efficient one, and little trouble was experienced with the cables. They had no information as to the testing systems of the Continental product. No resolution was passed, the matter being left to the Committee for the time being.

For Sale.—Worcester Corporation electricity department has for disposal two Weir direct-acting feed pumps. Swansea Corporation electricity department invites offers for surplus generating plant, including motor generators, motors, meters, gas engines, &c. Messrs. H. Butcher & Co. will sell by auction on November 19th and following day, at 13, High Holborn, W.C., surplus electrical stores and accessories, &c. (See our advertisement pages to-day.)

Social Events.—The seventh annual dinner of those engaged in the Wakefield Electricity Department was held at the Great Bull Restaurant on October 30th. Mr. H. G. Frazer, city electrical engineer, presided, and he was supported by the Mayor-Elect (Alderman C. Mellor, J.P.), Alderman W. Emmett (chairman of the Electricity Committee), Councillor J. D. Jackson, J.P. (deputy-chairman), and other members of the Committee. The toast of "The Undertaking" was proposed by Alderman Emmett and responded to by Mr. Frazer. There was an interesting musical programme.

The employés at the head office and works of Messrs. William White & Co., together with their friends, spent a social evening last Saturday at the "Horns," Kennington. Mr. H. Foster presided. After dinner the evening was devoted to music and dancing.

Ex-British Westinghouse Association. — Mr. L. S. Richardson, the secretary of the Association, has sent us an up-to-date list of members and "bad lads." We have also received a copy of "Inter Nos," the Association's occasional journal, which is full of bright reminders regarding the payment of subscriptions, and also contains some notes on the last annual dinner. The next annual dinner is to be held on March 5th at the Holborn Restaurant.

The Dutch Electrical Market.—The position of the electrical market in the Netherlands was recently reviewed by *Commerce Reports*. According to our contemporary electricity is employed to only a very limited extent in Dutch homes owing to the high charges for electricity which prevail generally as well as to the conversatism which exists. Where domestic electrical appliances are used, however, they are mainly of German origin, although Great Britain and Switzerland supply articles of a better class. Vacuum cleaners are an exception to the general rule in that they are widely employed; most of these are of American manufacture. There is no scope for washing machines as usually laundry work is not done at home. Fans, too, are not much used owing to the equable temperature, and for the same reason there is little demand for refrigerators. In most cases the retailer buys electrical appliances from an agent or importer, but some large retailers import direct from the manufacturer.

A Report upon Angola.—Mr. A. B. Hutcheon, the British Consul-General at Loanda, has forwarded a report upon Angola (Portuguese West Africa) to the Department of Overseas Trade (Stationery Office, 1s. 6d. net). It is stated that as the country develops its purchasing power will increase and it will afford greater possibilities for trade. Business, on the whole, is said to be very risky at present. Mention is made of a concession granted to a Portuguese group for the harnessing of the Mabubas Falls on the Dande River. Owing to a dispute with the Government regarding the price to be charged for energy the work has not yet been commenced. The Government has undertaken a survey of the country's water-power resources. Concessions have been granted in respect of copper, manganese, and mica deposits, but it appears that little has been done as yet.

Trade with Colombia.—In the course of a report upon Colombia which he has forwarded to the Department of Overseas Trade (Stationery Office, 2s. net), Mr. W. J. Sullivan, British Vice-Consul at Bogotá, says that, without unduly magnifying the importance of Colombia as a market, it may fairly be urged that more could be done to develop British enterprise in various lines. Experience has shown that the practice of having energetic travelling agents in the country has yielded satisfactory results. Credit facilities on terms no less generous than those offered by competitors should be granted, and all catalogues and correspondence should be in Spanish. In the supply of electrical goods the United States predominates at present. Opportunities, nevertheless, occur from which British manufacturers might derive some profit. The installation of new telephone or lighting systems in the smaller towns of the Republic is cited by way of illustration. Colombia possesses large, though at times uncertain, reserves of water power, and their adaptation to the generating of electricity may be expected to increase, if slowly, during the coming years. The Government intends to renovate the telegraph system when funds become available, and developments in the telephone service are also under consideration. The Government has recently purchased radio-telegraph and telephone installations and proposes to extend the use of these services.

A Travelling British Empire Exhibition.—For the benefit of those in provincial centres who were unable to visit Wembley, the Self-Supporting Empire League, under the chairmanship of Admiral Mark Kerr, C.B., M.V.O., has organised a representative British Empire Exhibition which is to make a tour of the chief towns of England and Scotland shortly. The towns scheduled are Southampton, Bournemouth, Exeter, Plymouth, Bristol, Cheltenham, Cardiff, Birmingham, Stoke, Chester, Liverpool, Bradford, Glasgow, Edinburgh, Newcastle, Stockton-on-Tees, York, Leeds, Manchester, Sheffield, Nottingham, Coventry, Leicester, Northampton, Norwich, and Ipswich. The largest hall in each place will be taken for a period ranging from six to 21 days, and the whole tour will occupy about a year. Further details can be obtained from the Secretary of the League at Polebrook House, Golden Square, W.1.

Austrian Lighting Development.—The Austrian Lighting Technics Association has recently organised in the works of the Norma Instrument Co., in Vienna, an exhibition devoted to the technical side of lighting with the object of developing and encouraging the use of modern lighting equipment in the country.

New French Companies.—La Société Union Electrique du Finistère is the name of a new undertaking which has recently been formed at Landerneau, with a capital of 700,000 fr., to establish a plant to supply electricity in the Department of Finistère.

A new company has lately been formed in Paris (9, Rue de Rocroy), with a capital of 125,000 fr. and the title La Société des Applications Radiophoniques, to manufacture radio apparatus.

A new company has just been formed at Clichy, Paris (31, Rue de Madame Sanzillon), with a capital of 2½ million fr. and the title La Société des Etablissements Leclanché, to acquire and carry on works for the manufacture of Leclanché batteries.

The British Empire Exhibition.—The Exhibition came to an end on Saturday last, when it was officially closed by the Duke of York. At a meeting of the Exhibition Association on October 26th, under the chairmanship of Mr. J. H. Thomas, M.P., it was unanimously decided that the company should be wound up voluntarily, and a meeting to confirm this decision is to be held on Tuesday next.

The Sydney correspondent of *The Times* says that action is being taken in Australia by leading citizens who were prominently connected with the British Empire Exhibition to support the suggestion of a permanent British Industries Fair. Representations have been made to Senator Wilson, chairman of the Australian Commission, to convene an early meeting of his colleagues with a view to communicating with the British Government. There is a considerable body of feeling in the Commonwealth that unless the Wembley display is used as the starting-point of a constant advertising campaign, its cost will ultimately be regarded as almost wasted.

The Australian Tariff Board.—Following upon the presentation to the Federal Parliament recently of the annual report of the Tariff Board, reports by that body on specific applications for revised duties have been published. The board was of opinion that the electrical engineering industry was in need of further protection because of the marked difference in wages paid in the United Kingdom, and the difference in cost of raw materials in the two countries. The board recommended that duties be increased in order to endeavour to equalise the cost of goods produced abroad with the cost of production of similar goods in Australia. The Board considered requests for duties of 50 per cent. and upwards on certain types of machines and appliances of British origin, with corresponding increases that would be necessary under the general tariff to preserve British preference; but, having regard to the burdensome effect that such imposts would have on other industries, was of opinion that those requests should not be granted.

Chinese Notes.—The residents of Chapoo, near Shanghai, have raised $20,000 for the construction of an electric lighting plant.

A new power station has been built by the Suiyan Electric Light Co. to replace its obsolete and inadequate plant.

The Soochow telephone system is being extended to Hukwangchen and Motoh, two neighbouring market towns.

The Min Hsin Electric Light Co., Shihpu, Chekiang province, has been registered at the Ministries of Agriculture and Commerce, as have also the Wei Yu Electric Light Plant, Yutsehsien, Shansi province, and the Han Ming Electric Light Co., Chutangchen, Taihsien, Kiangsu province.

The board of the Peking Tramway Co., Ltd., proposes to construct a line round the city and is to undertake the south-western section in the first place.

The Changsu Electric Light Co. (Kiangsu Province) has recently increased its capital from $36,000 to $40,000 for the purpose of purchasing new plant.

The Chang Ming Electric Light Co. is being formed with a capital of $20,000 to supply electricity to Changlientang, Kiangsu Province.

The police authorities in Shansi Province have placed a levy on electric signs.

The Shanghai-Paoshan Tramways Co., organised to install and operate a system of tramways between Shanghai and Paoshan, is shortly commencing the construction work. The company has a paid-up capital of $300,000 and a nominal capital of $1,500,000.

The Japanese Electrical Industry.—A special meeting of the Japanese Electrical Association was held in September to consider methods of improving the organisation, &c., of the electrical machinery and apparatus industry. A number of matters were recommended to the attention of manufacturers, including the formation of combines to produce on a large scale, standardisation, the training of suitable men as engineers, the combating of price cutting, the organisation of the export trade, the prevention of the production of inferior goods, &c.

New Italian Companies.—Among the new concerns recently formed in connection with the electrical engineering and supply industries in Italy, are the Società Costruzioni Elettricita Friuli Orientale, of Trieste, capital 1,000,000 lire; La Società Italiana Porcellane Elettrotechnichi Poul, Milan, capital 125,000 lire; the Società Elettrica Salentina, formed at Bari with a capital of 100,000 lire; La Società Elettrica Latronichese, Latronico, 200,000 lire; and La Società Idroelettrica Stura, Turin, 100,000 lire.

The British Industries Fair. — The Comptroller of the Department of Overseas Trade says that a practical illustration of the advantage to British manufacturers of exhibiting at the British Industries Fair has just been forwarded to the Department by an exhibitor. The firm in question recently received a very large order from an overseas buyer, and as the firm had no agent in that country it was naturally puzzled as to why it had received the order. Accordingly it asked the buyer, who said that it was entirely due to the British Industries Fair catalogue.. The buyer, before leaving for England, had asked for the names and addresses of several genuine British manufacturing firms in the particular trades in which he was interested, with the result that a copy of the catalogue was placed in his hands. Not only does this catalogue, which contains the names and addresses of all exhibitors, together with a note of their productions, reach all buyers who attend the Fair, but advance copies are distributed by the Department to known overseas buyers. Its classified index is printed in nine languages, and, retained by buyers for reference as a guide to British manufacturers, constitutes a very valuable advertisement for exhibitors from which results have been known to accrue after the close of the Fair.

Electric Steel Production in Chile.—*Commerce Reports* states that the Cia. Electro-Siderurjica e Industrial de Valdivia, organised by Chilean engineers and capitalists in 1924, has acquired certain hydro-electric rights near the city of Valdivia, Chile. The company, which is to have a capital of 13½ million gold pesos (£1,060,000), will erect a 32,000-h.p. hydro-electric station and works capable of producing 50,000 tons of iron and steel annually. The Government is to be allotted shares to the value of 400,000 pesos and given the right to obtain further stock not exceeding 40 per cent. of the total.

Film Publicity.—The use of the kinema for advertising commercial products calls for a great deal of ingenuity, for it has to be remembered that the large public which attends picture theatres has paid for entertainment, and is not disposed to swallow too much advertising unless this is very skilfully carried out. Film publicity has accordingly become a fine art—the difficult art of combining amusement and advertising. Last week we witnessed a number of up-to-date examples of this class of work, produced by Publicity Films, Ltd., at the Rialto Theatre, Coventry Street, W. These dealt with products so far apart as pills and radio valves, and each possessed originality and interest in a great degree. The producers seem to be capable of treating any subject in a fascinating manner; some of the subjects with which the exhibited films dealt were very unpromising indeed. In the list of the undertakings which have utilised this service we notice the names of several well-known electrical companies.

New Municipal Electricity Offices and Showrooms.—The borough electrical engineer of Plymouth has been instructed to present a report to the Electricity Committee with regard to the establishment in the centre of the town of electrical showrooms and inquiry offices.

American Loan for Norwegian Company.—The Oslo correspondent of the *Financial Times* reports that the Norwegian Power Co., Sandefaldene, has arranged for a $4 million loan in New York at 98 per cent. The security is a first mortgage upon the company's property, plus a guarantee.

Visit to Electrical Showrooms.—On Tuesday last a party of members of the Electrical Association for Women paid a visit to a display of electrical apparatus in appropriate settings at Messrs. Shoolbreds, Tottenham Court Road, W. Mr. Geary gave an address on "The Artistic Value of Electricity in the Home," followed by tea.

Works Visit.—On October 29th a party of wholesalers from the London district visited the Cosmos Lamp factory at Brimsdown, Middlesex, making a tour of inspection of the lamp-making and heating and cooking departments. This was one of many trade visits arranged by Metro-Vick Supplies, Ltd., in connection with its 1925-26 "Cosmos" lamp campaign.

The Rumanian Electrical Market.—The American Commercial Attaché at Bucharest, in the course of a report upon the possibilities for electrical sales in Rumania, says that the use of electric fans in offices, hotels, &c., is increasing, although they are not much employed in the home. There is scope for washing machines, as the home laundry facilities are far from modern. Very few electric cookers are used, and these are mainly of German origin. Grills and immersion heaters are popular and the use of toasters is growing, but electric kettles, percolators, &c., are rarely found in homes. A few radiator type heaters of German manufacture are in use, but there are no luminous heaters on the market. The local dealer buys electrical appliances direct from the manufacturer, and firms undertaking representation usually require an agency for the entire country.

Copper, Lead and Rubber Prices.—Messrs. F. Smith and Co. report November 3rd:—Copper (electrolytic) bars, £69, 10s. increase; do. do. sheets, no change; do. do. wire rods, £79, 10s. increase; do. do. h.c. wire, 9 13-16d., 1-16d. increase.

Messrs. James & Shakespeare report November 3rd:—Copper bars (best selected), sheet and rod, no change; English pig lead, £39 5s., 30s. decrease.

Messrs. Edward Till & Co. report November 3rd:—India-rubber, Para fine, 3s. 9½d., ¼d. increase.

Lighting and Power Notes.

Abergele.—Special Order.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them authorising the Urban District Council to supply electricity in the district.

Adwick.—Electricity Scheme Hitch.—A difficulty has arisen in connection with the Urban District Council's electricity scheme, on which about £30,000 has been expended, so far as the supply to the district of Woodlands East is concerned. The Council's scheme is to buy electricity in bulk from local colliery undertakings and to distribute to householders at a fixed charge of 1s. 6d. per week for five points per house, and 1s. 7½d. for seven points. The scheme was accepted by public meetings, and the Council proceeded with the installation of cables, &c. Householders at Woodlands East, which is one of the first places to be served, have now submitted a petition demanding a 50 per cent. reduction in the charges, and refusing to take the electricity otherwise. The Council declares that the price fixed is the lowest possible without making the undertaking a charge on the rates.

Barnstaple.—Loan.—The Town Council has applied for sanction to a loan of £2,000 for mains, services and meters.

Barrow.—Hydro-Electric Scheme.—At a meeting of the Town Council, on October 27th, the terms were discussed of the compensation to be given by the Corporation in carrying out the Backbarrow hydro-electric scheme to the Backbarrow Charcoal Iron Co., and the Lancashire Ultramarine Co., whose works are on the banks of the River Leven at Backbarrow, and who own the water rights. The proposed terms with these companies are an allowance of 200 kW and 400,000 kWh per annum free of charge, that each company be paid .375d. per kWh for unused energy up to 400,000 kWh (the maximum payment to each company in any year not to exceed £330), and that the companies pay the Corporation .625d. per kWh for the next 350,000 kWh. The terms also include the installation of motors by the Corporation in both works. Objections were raised to the terms by members of the Council, and it was ultimately agreed that they should be reconsidered by the Negotiating Committee and the final terms submitted to the General Purposes Committee.

Bewdley.—Electricity Supply.—The Town Council has received a communication from the Shropshire, Worcestershire and Staffordshire Electric Power Co. stating that the company's programme for 1926 provided for an extension of the overhead system into Bewdley. It was hoped that the work of the Stourport-Bewdley section would be proceeded with at the beginning of next year, and that an electricity supply would be available by about June.

Bexhill.—New Plant.—The Town Council has sanctioned the purchase of new plant at a cost of £13,600, and an order is to be placed for one 1,250-kW converter and switchgear at a cost of £7,883. A duplicate converter, to cost £5,760, is contingent on financial assistance from the Unemployment Grants Committee.

Canada.—Export of Electricity.—Lack of rain in the State of Washington has caused a serious shortage there this year of hydro-electric power, with the result that heavy calls have been made on the power resources of British Columbia. Arrangements have been made between the Puget Sound Power & Light Co., of Seattle, and the British Columbia Electric Railway, for connecting up their respective systems.—*Reuter* (Vancouver).

Carlisle.—Extension of Supply.—The Electricity Committee is to provide a supply of electricity to the Cocklake Works of the Gotham Co., which will necessitate an expenditure of £6,201 for mains, switchgear, and transformers.

Cheltenham.—Electricity Supply.—At a meeting of the Corporation Electricity Committee the electrical engineer reported having conferred with the Gloucester city electrical engineer as to the future supply of power for the areas of the two authorities, and that they considered it desirable that reports and estimates should be considered by an independent consulting engineer. The Committee has appointed Messrs. Preece, Cardew and Rider to report on the proposals for a joint supply.

Chester.—Rural Electricity Supply.—Two years ago the Corporation obtained sanction for loans amounting to £38,338 for the purpose of distributing electricity in parts of the area covered by the Chester Electricity (Extension) Special Order. The loans have been used to construct three lengths of high-pressure transmission lines aggregating 15.4 miles, and the construction of 29 miles of low-pressure distribution lines. Thirty-seven isolated consumers have undertaken to make yearly payments, which aggregate an income of £1,618 per annum. The distribution lines pass approximately 1,800 premises, of which 605 have either been connected or have applied for a supply. Judging by the inquiries made by the residents in the district, and the interest taken in the scheme, Mr. S. E. Britton has no doubt that the effort the Corporation is making to supply electricity in the rural area around Chester is much appreciated, and when the system has had sufficient time to develop it will be a complete success. The scheme to supply the area, as originally formulated, provided for the construction of three high-pressure transmission lines from Chester towards the boundaries of the area and the interconnecting of these lines so as to form a complete ring line capable of supplying the whole of the area. The three lines and two sections of the ring line have been constructed and are in use. To complete the ring an additional twelve miles of transmission line is required, costing approximately £10,800; a further sum would be required for the provision of additional sub-stations and low-pressure distribution lines, say £9,400, making together a total of £20,000. At a meeting of the City Council on October 28th, a resolution was passed authorising the Electricity Committee to apply for sanction to a loan of £20,000 to complete the scheme.

Clacton.—Electricity Supply.—An extension of its electricity supply to rural areas is to be considered at the next meeting of the Urban District Council. The charges for

electricity to the neighbouring parish of Little Holland have been fixed as follows:—Lighting, 8d. per kWh; power, 3d. per kWh; heating and cooking, 2d. per kWh.

Congleton.—PROPOSED ELECTRICITY SCHEME.—At a recent meeting of the Town Council Mr. Vernon Hope, electrical engineer, of Macclesfield, submitted a scheme for obtaining an electricity supply for the town. He recommended the Corporation to obtain a supply from the Stoke-on-Trent Corporation, by means of overhead lines.

Continental.—GERMANY.—An 80,000-h.p. steam turbine and 60,000-kW Siemens-Schuckert 7,000-V generator have recently been added to the Goldenburg super-power station of the Rhenish-Westphalian Electricity Co. The brings up the capacity of the plant to 290,000 kW, making it the largest generating station in Germany using lignite as the steam-raising medium.

AUSTRIA.—According to a report lately drawn up by the Austrian Ministry of Commerce and Communications, there were at the commencement of the current year 537 generating plants with a maximum capacity of 89,087 h.p. in operation. The report shows that 244 new hydro-electric stations, representing a total of 292,754 h.p., were in course of construction at the beginning of 1925, the most important being the Luner Lake station of 60,000 h.p. which the Vorarlbergen Ilwerke Gesellschaft is erecting in the Vorarlberg.

BULGARIA.—The Government has nationalised all available water power and announced the terms on which it is prepared to grant concessions. Among the more important hydro-electric stations now in course of construction are the Watschar on the River Kritschin and the Orion undertaking on the Rila river. The last-named will comprise three stations at Rila, Pastra, and Ilina respectively. The first portion of the Pastra plant has already been completed; it comprises three 3,300-h.p. Francis type turbo-alternators. The output is being utilised in the town of Subrica, at various works in the vicinity, and at the State Collieries at Pernik.

Croydon.—LOANS SANCTIONED.—The Corporation Electricity Committee has received sanction to loans of £17,410 for boiler-house buildings and £23,719 for boiler-house plant.

Eccles.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer: Mr. H. W. Angus) for the year ended March 31st last, record a total revenue of £41,018, as compared with £36,928 in 1923-24. Working expenses amounted to £29,331, as against £24,782, leaving a gross profit of £11,689 (£12,146). After deducting capital and other charges there was a net surplus of £3,377, as compared with £4,480 in the preceding year. This was transferred to the reserve fund, which now stands at £12,778. The capital expenditure during the year amounted to £12,483, and included £9,199 for mains. The sales of electrical energy increased from 4,332,172 to 4,942,464 kWh.

Exeter.—ELECTRICITY AGREEMENTS.—The Topsham Parish Council has accepted the terms offered by the Corporation Electricity Department for street lighting, and the Crediton Urban Council has also accepted the terms for a supply of electricity in its area.

Halifax.—YEAR'S WORKING.—The report on the working of the Corporation electricity undertaking (engineer: Mr. W. M. Rogerson) for the year ended March 31st last, records a total revenue of £180,679, as compared with £178,596 in 1923-24. Working expenses amounted to £96,546, as against £91,130, leaving a gross surplus of £84,133 (£87,466), to which was added interest on investments, making a total of £88,652. After providing for capital charges a net profit of £23,026 remained, as compared with £32,596 in the preceding year. A contribution of £6,864 was made to the borough fund. The amount spent on capital account during the year amounted to £100,296, and included £43,153 for machinery and £11,905 for mains and services. The electrical energy sold increased from 21,367,440 to 23,668,249 kWh, and the average price obtained fell from 2.005d. to 1.832d. The maximum supply demanded rose from 11,150 to 12,540 kW.

London.—STEPNEY.—*Year's Working.*—The report of the borough electrical engineer, Mr. W. C. P. Tapper, on the working of the electricity undertaking for the year ended March 31st last, shows a total income of £287,505 and working expenditure of £153,287, leaving a gross profit of £134,218. The corresponding figures for the previous year were £261,283, £148,373, and £112,910, respectively. To the gross surplus were added receipts from other sources, making a total of £141,389 available. Capital charges absorbed £85,707, and there was a net surplus of £55,682, as compared with £38,736 in 1923-24. The capital expenditure during the year amounted to £135,957, the chief items being £42,492 for machinery and £51,999 for mains. The sales of electrical energy increased from 42,140,142 to 44,520,753 kWh, and the average price obtained from 1.476d. to 1.528d. The maximum load rose from 19,070 to 21,680 kW.

SLIDING SCALE PRICES.—A decision has been arrived at by the Electricity Commissioners that the effective date of operation for the sliding scale of prices and dividends relating to those companies affected by the London Electricity (Nos. 1 and 2) Acts, 1925, shall be January 1st, 1926. The companies concerned are to fix their standard prices for approval by the L.C.C., in order that the sliding scale may come into effective working at the earliest possible date.

Manchester.—PROGRESS DURING SEPTEMBER.—During the month of September the Corporation electricity undertaking showed an increase in connections of 1,353 kW, bringing the total to 269,703 kW; and the number of applications received for supply, including existing consumers for additional supplies, was 929, representing a total of 2,155 kW. The number of consumers connected increased by 394, and the number of hired cookers connected by 62, bringing the total actually on circuit to 990. Applications for the hire of cookers totalled 100.

Northern Ireland.—PORTRUSH (CO. ANTRIM).—A fire recently occurred at the municipal power station. The outbreak originated in a store where oils, cable, bitumen, and other inflammable materials were kept, and this part of the building was gutted. The fire spread to the roof of the main buildings of the station, which was considerably damaged.

North Wales.—ELECTRICAL DEVELOPMENT.—At a recent meeting of the North Wales and South Cheshire Joint Electricity Authority, at Llandudno, it was reported that the following transmission lines had been completed:—The Trevor to Pwllheli section, the St. George section, and the section from Connah's Quay to Bagillt. Considerable progress had also been made with regard to the lines from Llanfrothen to Four-crosses, Cwm Dyli to Llanfrothen, Legacy to Crewe, and Hawarden to Mountain Colliery, and work had commenced on the Llanfrothen to Maentwrog and Crewe to Sandbach sections. The actual construction of the main dam of the new reservoir at Maentwrog is proceeding, the foundations having been laid. The meeting decided to communicate with the North Wales Power Co. with a view, eventually, to submitting a report to the Electricity Commissioners on the policy which it may be desirable to adopt with the object of carrying electricity into rural areas.

LAKE DAM BURSTS.—It is reported in the daily Press that the North Wales Power Co.'s lake dam above Dolgarrog, in the Conway Valley, burst on November 2nd, and the water poured down the hillside. Apparently the Eigiau dam burst about 9.30 p.m., and the water swept away the smaller dam. Buildings were damaged, cattle drowned, and loss of life is reported.

Plymouth.—NEW PLANT.—Application is being made by the Corporation Electricity Committee for sanction to a loan of £41,275 for additions to the generating plant. It is proposed to remove two obsolete engine-driven sets at the Prince Rock power station and replace them with an additional turbo-alternator with a capacity of not less than 6,000 kW, together with the necessary auxiliaries, pipework, and switchgear. The estimate also covers an additional converter.

Preston.—ELECTRICITY SUPPLY.—The Electricity Committee is applying for sanction to further loans, including £4,250 for the alteration of the system of supply in the Ribbleton area, and £900 for the equipment of a meter test room at Crown Street. The Council has been asked to approve the agreement for the supply of electricity in bulk to Blackpool, together with resolutions for sanction to the construction of transmission lines at a cost of £66,000 (each Corporation paying one-half).

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

LONDON.—*The Charing Cross Electricity Supply Co., Ltd.*—Heating and cooking: Reduced to 1½d. per kWh.

BRIGHTON.—Sliding scale: First 10,000 kWh per annum from 5d. to 4½d. per kWh; second 10,000 kWh, from 4d. to 3½d.; next 10,000 kWh, from 3d. to 2½d.; all energy in excess of 30,000 kWh to remain at 2d. per kWh as at present. Power, heating and cooking: Flat rate from 1½d. to 1d. per kWh. Street lighting: From 2d. to 1½d. per kWh. Electricity supplied in the areas of Southwick, Portslade, and Rottingdean to be charged at 7d. per kWh for lighting, and 2d. per kWh for power.

Rugeley. — ELECTRICITY SCHEME. — The Urban District Council, after considering a draft agreement with Major C. H. B. Prescott-Westcar with reference to an electricity scheme, decided that the agreement should contain a clause to the effect that the company shall, if requested by the Council, supply electricity for street lighting. Mr. W. H. Robins, borough electrical engineer, Stafford, has been asked to advise the Council on the technical side of the scheme.

Skegness. — ELECTRICITY SUPPLY. — The Urban District Council has revoked a former decision to take a bulk supply of electricity from the power station of the National Electricity Construction Co., Ltd., at Boston, and has decided to install its own generating plant.

South Africa.—DURBAN.—According to the *South African Power Engineer* the plant at present installed in the municipal power station will be unable to cope with the demand for power until such time as the Electricity Supply Commission's power station at Congella (which is not due for completion until October, 1927) is in working order, and the Town Council is now in consultation with the Commission regarding the purchase of another 5,000/6,000-kW turbo-alternator set, which, with the first set recently installed, will be ultimately taken over by the Commission at a price to be mutually agreed upon, and installed by the latter in its Congella station. A second 45,000/60,000-lb. boiler will also be required, and it is anticipated that this, as well as a plant of similar capacity installed at the municipal station about a year ago, will also be taken over by the Commission.

West Mersea.—OPPOSITION TO SCHEME.—The proposal to establish a hydro-electric generating station on the creeks at West Mersea, near Colchester, is being opposed by the Parish Council on the grounds of alleged damage to navigation, oyster fisheries, and the health of the district.

Willesden.—YEAR'S WORKING.—The accounts of the Urban District Council's electricity undertaking (engineer: Mr. A. W. Blake) for the year ended March 31st last show a total income of £133,678, as compared with £118,492 in the preceding year. Working expenses, including the purchase of a bulk supply from the North Metropolitan Power Supply Co., Ltd., amounted to £98,105, as against £82,975, leaving a gross profit of £35,573 (£35,517), to which was added revenue from other sources, making a total of £45,622. Capital charges absorbed £35,884, and works of a capital nature charged to revenue amounted to £15,613. Thus there was a deficit of £5,876, as compared with a surplus of £8,402 in 1923-24. The capital expenditure amounted to £38,957, and included £12,798 for mains and services. The electrical energy sold increased from 12,590,487 to 15,109,106 kWh, and the average price per kWh obtained fell from 2.259d. to 2.123d. The maximum supply demanded rose from 7,206 to 8,330 kW. During the year the work of converting the street lamps from gas to electricity was completed, and a 750-kW converter was installed at Salusbury Road sub-station.

Windsor.—REDUCTION OF MAXIMUM CHARGE.—The Windsor Electrical Installation Co., Ltd., has applied for a Special Order to reduce the maximum price of electricity from 1s. to 10d. per kWh, with the deletion of the minimum quarterly charge.

Wirral.—INQUIRY.—The Electricity Commissioners are to hold an inquiry on November 17th into the Rural District Council's application for a loan of £135,000 to cover the cost of its electricity scheme.

Worthing.—NEW PLANT.—Acting on the advice of the borough electrical engineer, Mr. G. Porter, the Town Council has decided to apply for consent to an extension of its generating plant by the installation of one 750-kW Diesel set at an estimated cost, including foundations, switchgear, cable connections, and other accessories, of £15,850.

Tramway and Railway Notes.

Birmingham.—ACCIDENT.—The first accident to be recorded on the railless-car system occurred on October 30th. A tram-car was proceeding from the city to Nechells when the steering gear broke and the vehicle crashed into an electric cable standard. Five of the passengers received serious injuries and were conveyed to hospital for treatment.

Brighton.—TRAMWAY EXTENSION.—The Tramways Committee has decided to extend the Lewes Road tramway track to Natal Road, at an estimated cost of £11,000.

Colne.—TRACK RENEWALS.—The Town Council has received sanction from the Minister of Transport to a loan of £3,700 for the renewal of the tramway track in Burnley Road.

Continental.—SPAIN.—Work is well in hand on the construction of an electric railway between Zumarraga and Zumaya, which will connect the Northern of Spain (Madrid-Hendaye) railway with the Vascongadas (Bilbao-San Sebastian) line. The new line, including a branch to the harbour at Zumaya, will be about 23 miles in length, and is expected to be ready for operation within 12 months.

NORWAY.—*Modern Transport* states that the Holmen Kollen Co., of Oslo, has arranged for a loan of 11,500,000 kroner with a consortium of Norwegian banks and insurance companies, for the construction of an underground railway.

BELGIUM.—The Société Nationale des Chemins de Fer Vicinaux, of Brussels, has decided to extend the local railway between Ostend and Westende as far as the Franco-Belgian frontier. The work will be put in hand as soon as the financial arrangements have been completed with the Government.

The Société des Tramways Electriques du Pays de Charleroi et Extensions is extending the electric tramway between Charleroi and Couillet to Chatelet, and the Charleroi-Gilly line to Vieux Campinaire.

ITALY.—The Minister of Railways and Communications has authorised the immediate electrification of the line from Genoa to Ovada; authority has already been granted for the electrification of the Ovada-Alessandria line. It is also proposed to electrify the route from Ovada to Asti.—*Reuter's Trade Service* (Rome).

A new electric railway has lately been completed and opened for traffic between Intra and Premeno.

AUSTRIA.—The *Gazette de Prague* says that in addition to the electrification of the Innsbrueck-Bludenz section of the railway from Arlberg, which was opened four months ago, the Austrian Federal Railway Board has recently electrified the Stanach-Inning and the Attnang-Puchheim lines, the total length of which is 243 km. The necessary power is supplied by a station on Lake Spuller, and the economy in coal resulting from the electrification of these two lines will amount to about 130,000 tons a year. The electrification of the Salzburg-Woergl-Innsbrueck-Brenner, Kufstein-Woergl and Simmering-Gloggnitz-Murz lines will be begun in the near future.—*Reuter's Trade Service* (Prague).

London.—INAUGURATION OF WATFORD LINE.—The new electric railway from Baker Street to Watford, *via* Croxley Green, constructed by the Metropolitan and the London & North-Eastern Railway Companies, was formally inaugurated on October 31st and opened to the public on Monday last. There is a service of 140 trains a day, a proportion of which is electrically operated by the Metropolitan Co. to Baker Street. The London & North-Eastern Railway Co. has introduced a new steam train service between Watford and Marylebone. The cost of the scheme was £300,000.

Newcastle-on-Tyne.—PURCHASE OF UNDERTAKING.—At a meeting of the Corporation on October 30th, it was agreed to purchase the tramway undertaking of the Tyneside Tramways and Tramroads Co. for £118,125.

Port Stewart.—ABANDONMENT OF ROUTE.—According to the *Electric Railway and Tramway Journal*, the London, Midland and Scottish Railway has decided to abandon the tramway service between the railway station and the town, and to replace it by a motor-omnibus service. The tramway track is in a bad condition, and the company does not consider it advisable to incur the expense of reconstruction.

St. Helens.—NEW TYPE OF TRAMCAR.—A new design of tramcar, built in the Corporation tramway sheds, will shortly be put into service. The car will carry 82 passengers, 30 below and 52 on top. The new seats, which are placed across the car, are of the tip-up type. A special type of compressed-air brake is also fitted to the car.

Venezuela.—RAILWAY ELECTRIFICATION.—According to *Commerce Reports*, work on the electrification of the railway connecting Caracas with its port, La Guaira, is reported to be starting within a few months. Most of the necessary material has been ordered from England. The power station, which will probably be situated at Zig Zag, will be equipped with Diesel engine sets. The present 30-ton steam locomotives will be replaced by five electric units of 35 tons each. The cost of electrification, including the new rolling stock, is estimated at $750,000, and the length of line is 23 miles.

Yorkshire.—ROUTE TO BE ABANDONED.—The Yorkshire (West Riding) Tramways Co., Ltd., has announced that it is withdrawing the whole of its tramway service on the route between Pontefract, Castleford, and Normanton. Since the introduction of motor-omnibuses on the route there has been a considerable falling-off in the receipts, and the company has decided to substitute an improved 'bus service.

Telegraph and Telephone Notes.

China.—NEW TELEPHONE CO.—The Hongkong Telephone Co., Ltd., is a new local (British) company, whose scheme for the acquisition of the China and Japan Telephone Co. has been approved by the Government of Hongkong, according to the *T. & T. Age*. It was planned that the shares of the old company would be bought up for 1,400,000 Hongkong dollars, and that the new company would have a capital of 5,000,000 Hongkong dollars issued as 500,000 shares of 10 Hongkong dollars each.

Irish Free State.—TELEPHONE SERVICE.—In a recent address to the Dublin Chamber of Commerce, Mr. J. J. Walsh, Minister for Posts and Telegraphs, sketched the work of his department since it was taken over by the Free State. The deficit in the working of the Post Office, he said, according to the *Irish Times*, had been reduced from £1,400,000 to £540,000. For the first time in the history of the country the telephone system had shown a profit, and he favoured concentration on the telephone as the service most likely to benefit the business community. In Dublin underground schemes of considerable magnitude were in progress, and, since 1923, 54 miles of conduit had been laid, 123 manholes and footway chambers constructed, 94 miles of cable drawn in, 480 new distributing poles had been provided, 36 additional trunk lines had been set up, and new main distributing frames for 10,000 lines at the Central exchange, 3,200 lines at Ship Street, and 6,000 lines at Merrion Street had been installed. Now there were three trunk circuits between Dublin and Cork, two between Dublin and Limerick; one connecting Cork and Dublin, and when the traffic justified it another could be provided at once. It was expected that the first automatic exchange would be working in Dublin by the end of next year. A relief exchange was being installed in Merrion Street to relieve the congestion in the Central Exchange, and to open up an area which had been closed for some time owing to shortage of plant. A new exchange would be installed in Limerick early next year, and arrangements were being made for replacing the old exchange at Cork by up-to-date equipment. In March, 1922, there were 19,101 telephone stations, and at the end of September last 10,006 stations had been added. Principally owing to the depression in trade, 7,347 stations ceased operation during the same period, leaving a net increase of 2,759 stations. The present total was 21,800 stations. There were 194 exchanges in the Saorstat in March, 1922. Since then 127 new exchanges, of which 80 had been opened since the beginning of the year, and 210 telephone call offices, had been completed. There were now 762 call offices, as compared with 552 in 1922.

PARTY-LINE TELEPHONES.—The Free State Posts and Telegraphs Department is endeavouring to encourage and extend the use of the party-line system of telephone service in rural districts.

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Swiss Railway Electrification.

Some Particulars of Recent Power-Transmission and Railroad Schemes.

ELECTRIC traction on the Swiss railways has been entirely satisfactory up to the present, and is a constant source of congratulation amongst the Swiss themselves, who

Fig. 1.—A St. Gothard Locomotive.

feel delightfully independent of their neighbours' coal, and pleased with the cleanliness and increased travelling speed on the electric railways.

Fig. 2.—Electric Train on Meienreuss Bridge.

The whole of the network of Federal railways is not yet electrified, but by 1928 it is hoped 1,566 km. of track will be completed; this will include practically all the lines of the C.F.F. At the present time, the greater part of the railroad, with the exception of about 76 km., which is still run on a three-phase system, is supplied with single-phase energy at $16\frac{2}{3}$ periods, 15,000 volts. The different hydro-electric generating stations are linked up by an overhead transmission line at very high pressure, the distance between the distribution stations not exceeding 60 km., so that it is hoped that about 30 of the latter stations will be sufficient, taken in connection with the five big power houses, to supply the C.F.F. in its entirety in 1928. The transmission lines are mounted on open-work iron transmission towers, and the energy is transmitted at 60,000 V and at 30,000 V on the underground cables between Ritom-Amsteg-Glarnico. The converters in the distribution stations are generally 3,000- or 5,000-kVA machines, capable of dealing with 4,500 or 7,500 kVA for half-an-hour. The Gothard distribution stations are covered in, but those of more recent construction are of the out-door design, and have therefore cost less to erect. The contact overhead wires are of copper, and are supported by steel, copper-eased steel, or iron wires.

As to the locomotives and automotrices used by the C.F.F., they are of differing weight and type according to whether they are for use on the long steep declivities of the St. Gothard, or the easier slope of the Simplon, or the flat ground of the plateau. All are fitted with hand brakes and Westinghouse brakes, and the Gothard machines have an electric brake as well. Their maximum speed varies from 40 to 90 km. an hour according to the power and grade, and the kind of train to be drawn. Each locomotive is furnished with extra plugs affording a supply at from 800 to 1,000 V for the heating of the train. The railway carriages are each fitted with a radiator, or radiators, and during the coldest season the energy consumed for heating amounts to about 120 to 130 watt-hours per axle-kilometre. On the express trains, in which are included non-electrically-equipped carriages, coal-vans are placed between such carriages, so as to warm them by steam.

Extensive railroad schemes are also in hand. The Berne-Geneva section, which was expected to be finished by the end of this year, with the enlargement of the station at Romont, includes no fewer than eleven bridges between Renens and Nyon, and nine betyeen Nyon and Geneva, and also three viaducts. The total cost is estimated at three million francs. It is interesting to learn that an expenditure of a million francs has been incurred during the past year in replacing or reinforcing bridges, while considerably over two million francs has been spent on the provision of plant for the

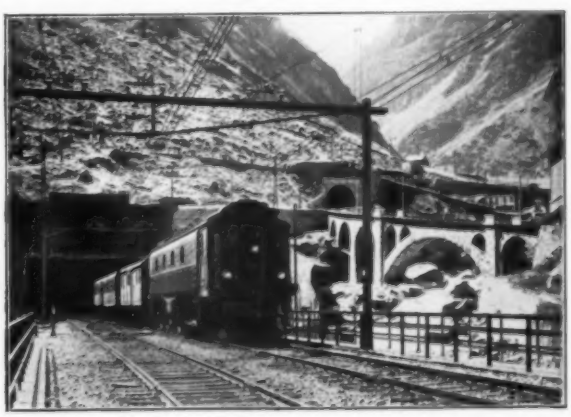

Fig. 3.—St. Gothard Tunnel Entrance.

lighting and heating of coaches, goods vans, &c. The Federal Railways, whose plant at Vernayaz was

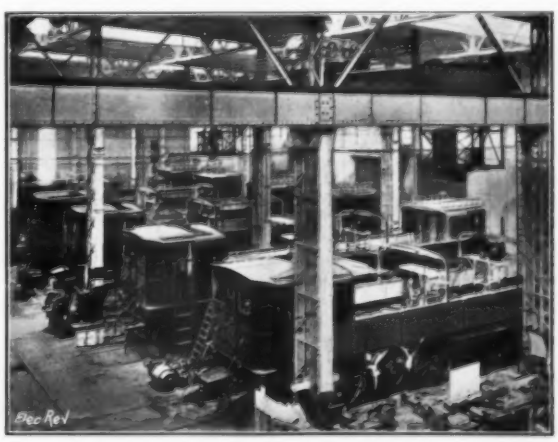

Fig. 4.—Electric Locomotives Under Construction.

to have a capacity of 108,000 h.p., were recently in negotiation for land for a new station at Etzee.

E

Electrical Developments at Stoke-on-Trent.

Extensions to the Plant at the Hanley Generating Station.

ON Thursday, October 15th, the development of the Stoke-on-Trent electricity supply undertaking was marked by the inauguration of considerable extensions at its Hanley generating station, one of a group of five such stations completing the system. The Hanley works was the original station of the group, and was established in 1894. The group includes the central power house to which the other stations at Hanley, Longton, St ke-upon-Trent and Burslem act as sub-stations. The new plant consists of four boiler units, a 6,000-kW turbo-alternator and auxiliaries, and two cooling towers.

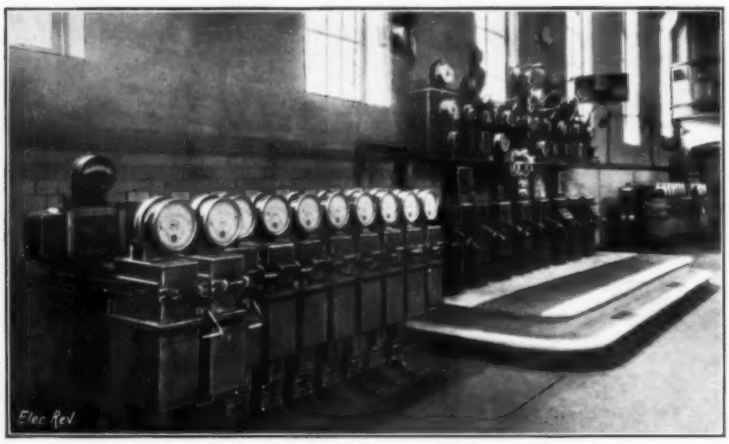

Fig. 1.—Switchgear at Hanley Sub-works.

Each boiler unit consists of a Stirling three-drum water-tube boiler, with two self-contained "Underfeed" chain-grate stokers. The total heating surface of each unit, including boiler, superheater, and economiser, is 8,632 sq. ft., and the normal output is 30,000 lb. of steam per hour at a pressure of 260 lb. per sq. in., and a temperature of 600 deg. F. The guaranteed efficiency is 84 per cent. on normal duty. The economisers are arranged at the rear of the units, while the induced draught plant, chimney, and grit arresters are carried on a platform above the boilers. Each boiler is fitted with Dewrance mountings, a Kent's steam-flow meter, a Cambridge CO_2 recorder and distance thermometers for indicating the steam, feed water inlet and outlet, and flue gas outlet temperatures. Two of the boilers are fitted with "Crosby," and two with "Copes" automatic feed water regulators. The stokers are designed for burning coal having a calorific value of from 10,500 to 12,500 B.th.u. per lb., and the consumption of each is measured by Lea coal meters. The induced draught fan for each boiler is driven by a 27-b.h.p. motor at 480 r.p.m. The runners are 45 in. in diameter.

The new generating set consists of a 6,000-kW turbo-alternator, fig. 2, with suitable surface condensing plant, the complete set having been constructed and installed by the Metropolitan-Vickers Electrical Co., Ltd. The turbine is of the impulse type, and is designed to give an economical output of 6,000 kW with a stop valve pressure of 250 lb. per sq. in., and a superheat of 250 deg. F.

The alternator is designed for a continuous output of 7,500 kVA at 0.8 power factor, 3 phase, 51½ periods, 6,000-6,600 V. It is of standard design, with steel slip rings and overhung exciter, having a radial commutator. The stator windings are protected by the Merz-Price balanced-current system, and by an automatic field switch mounted behind the switchgear control panel. The stator core has embedded thermo-couples, and the machine is fitted with the M.-V. closed circuit ventilating system.

The condenser, fig. 3, is of the surface type, having a cooling surface of 8,250 sq. ft. It is designed to maintain an absolute pressure of 1.72 in. at full load (corresponding to 28.28 in. vacuum) when supplied with cooling water at 70 deg. F. Air extraction is effected by either of the two-stage air ejectors with jet intercoolers which are mounted on the turbine floor level. Two rotary condensate extraction pumps are provided, each being designed to deliver 104,000 lb. per hour against a head of 60 ft. The cooling water is circulated through the condenser by either of the two centrifugal pumps, each designed to deliver 288,000

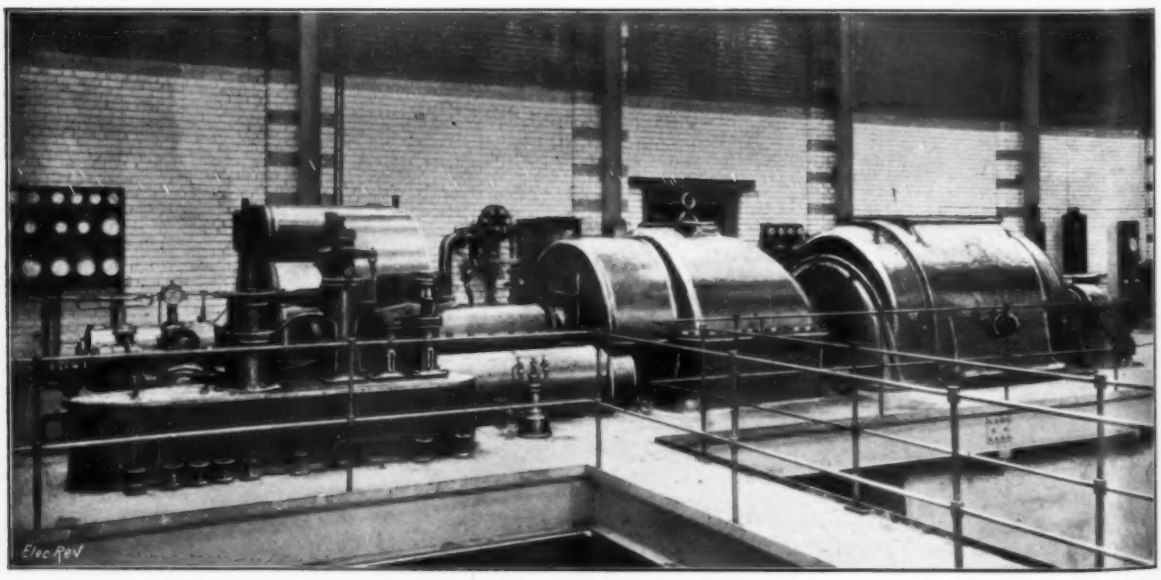

Fig. 2.—The New 6,000-kW Turbo-generator Set.

gallons per hour against a 44-ft. head. The switchgear controlling the alternator and the cables linking up the new set to the existing bus-bars have also been supplied by the Metropolitan-Vickers Co. With the new No. 5 set a radical departure has been made from the old system, and the switchgear is of the totally enclosed "ironclad" type, embodying many of the original features, such as the draw-out type switch, and mechanical interlocks. The type K3 switches controlling the new set are rated to carry 1,200 A at 6,600 V, with a breaking capacity of 300,000-kVA. The two bus-bar switches are non-automatic. The alternator switch is tripped automatically either by the operation of the Merz-Price relay, or by an inverse time limit overload relay of the new "PB" type. Fig. 1 shows the switchgear at the Hanley sub-works. In the basement, close to the alternator, is mounted an earthing resistance, controlled by an electrically-operated oil switch. The resistance is designed to carry 660 amps. leakage current for 30 seconds, or 110 amps. continuously. A Reyrolle low-pressure distribution switchboard is also provided in the new equipment.

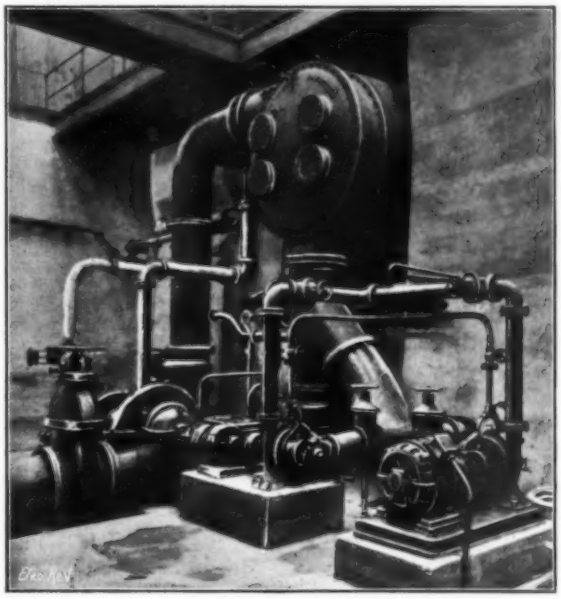

Fig. 3.—New Condensing Plant.

Two extension cooling towers by the Davenport Engineering Co., Ltd., of Bradford, have also been installed. They are of the natural draught, chimney type, and are designed to deal collectively with 400,000 gallons of circulating water per hour, reducing the temperature of this water from 86 deg. F. to 74 deg. F. with a wet bulb atmospheric temperature of 55 deg. F.

The extension coal bunkers, conveyors and elevator have been manufactured and installed by Ashton, Frost & Co., Ltd., of Blackburn. The coal is brought to the central power house from either the railway siding or the collieries direct by three automatic end-tipping battery electric vehicles.

A Fifeshire Hydro-Electric Undertaking.

The Balgonie Colliery Co.'s Installations.

WERE it not for the facts that good coal is available at a reasonable price and that most of her larger potential water power sites are remotely situated in relation to the industrial areas where the power might be used, Scotland's hydraulic resources would have doubtless been developed more rapidly than they have been for the production of electricity. It is accordingly of interest to note that the Balgonie Colliery has had the enterprise to develop the River Leven, which flows out of Loch Leven through its property, with a total fall of 56 ft., for power production purposes.

The Balgonie Colliery Co. has operated upon the Dysart main seam between the rivers Orr and Leven, in the upper Fifeshire coalfield, for over four centuries, and it is of interest to point out that nearly two centuries ago the colliery took advantage of the power of the river to drive a water-wheel pumping installation. The old lade which was then constructed, 2,000 yards in length, with the head works and tail race were later reconstructed and utilised in connection with the development in 1919 of a 13-ft. fall at the Milton Mill, from which it has been possible to obtain as much as 239 h.p.

The Milton plant consists of a double-runner open-type turbine with a central discharge, and separate gate control for each runner in order to obtain economy of water. The power developed by the turbine is transmitted to the generator through a set of double-helical spur gears arranged for forced lubrication, the gears increasing the number of revolutions of the turbine from 155 r.p.m. to 800 r.p.m. on the generator. A flywheel is fitted to the generator shaft, and the connection of the gear shaft to the generator is by a flexible coupling of the belt type.

Fig. 1.—Castle Hydro-electric Station, Fifeshire.

Fig. 2.—Back View of Castle Station.

The generator is a direct-current compound-wound machine with an output of 160 kVA at 440 volts. The speed of the alternator is controlled by an oil-pressure governor which automatically regulates the guide vane of the turbine. This installation was supplied complete by Messrs. James Gordon and Co., Ltd., and the results obtained were so encouraging that the Balgonie Company decided to develop the other 44 ft. of available head.

Fig. 3.—Intake, Showing Screens.

Incidentally, it should be stated that during the coal miners' strike of 1921 this Milton plant supplied power to the pits and the pumps, when no other sources of power were available, and thereby prevented flooding and the consequent serious damage underground and loss to the mine.

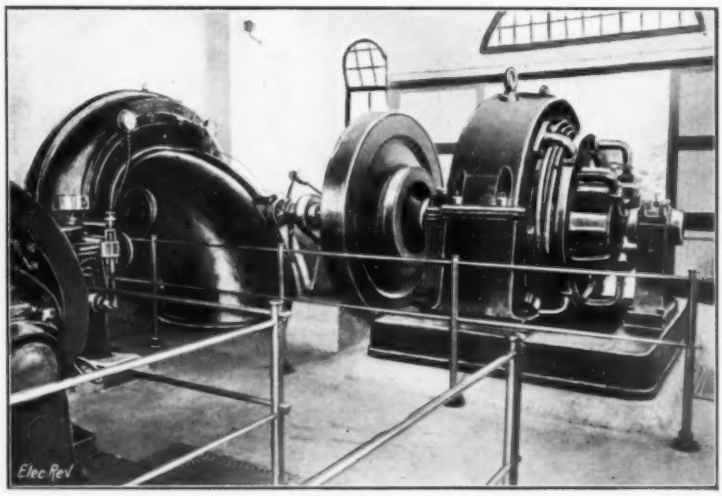

Fig. 4.—The 550-H.P. Turbo-generator.

The second plant, the Castle installation, is a much more extensive one, and necessitated a considerable amount of civil engineering work, in addition to the installation of the water-power plant proper. After a careful survey of the site and prevailing conditions, it was decided to lead the water to the turbines by means of a new headrace cut in earth, over a mile long and 22 ft. wide, and from the end of this by two short riveted-steel pipe lines (figs. 1 and 2).

The main intake from the river is controlled by three sluice gates, in addition to a by-wash gate in the weir. No puddle clay was used in the construction of the headrace, a procedure that has been fully justified by the results obtained. The first 100 yards, however, had to be constructed of substantial brickwork, as the North British Railway Co. made this a condition before permitting the headrace to be carried under one of the arches of the Markinch Viaduct. A by-wash is arranged near the pipe-line intake to take overflow water and to maintain as far as possible constant head on the turbines.

At the end of the headrace an intake (fig. 3), built in concrete and bricks, is arranged in which three sluice gates, each 7 ft. wide, are situated. The intake is divided into two sections, each complete with its own fine strainer, so that access to any one of the two pipe-lines and turbine can be obtained without interfering with the working of the other turbine. A set of coarse strainers is fitted in front of the sluice gates in order to catch heavy debris without interfering with the water flow. The intake is arranged with reinforced-concrete platforms to give convenient access to the strainers and sluices. After its removal from the strainers, debris is pushed along the platform to an opening in the parapet wall, from where it is thrown down on to a steep slope where water from the wash-out valves in the headrace acts as a powerful conveyor of the debris into a basin below. This cleaning of the water at the Castle installation almost eliminates the necessity of cleaning the strainer racks at the Milton installation lower down the river.

The pipe-line consists of two riveted-steel pipes both 63 ft. long; the one serving the large turbine is 60 in. in diameter, and that serving the smaller turbine is 54 in. in diameter. There is no necessity for expansion joints in this case, but a wedge-shaped section is provided at the junction of the turbine and the pipe-line to permit easy removal.

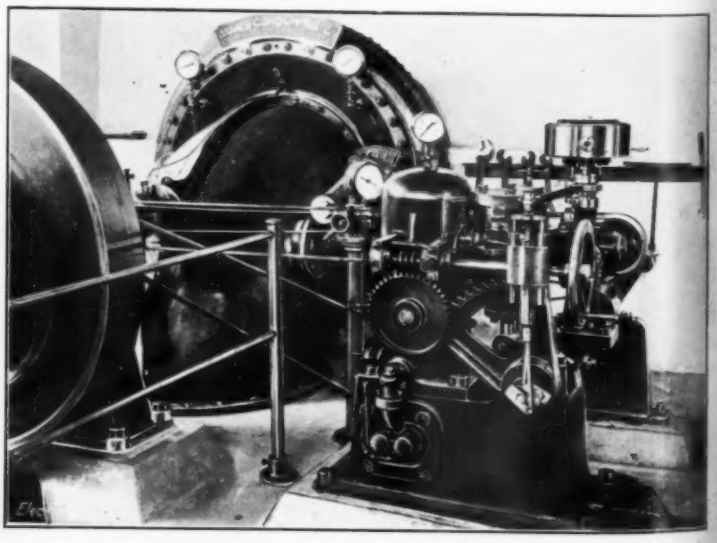

Fig. 5.—Turbine Governor Gear.

The turbines themseles are of the axial-entry cased type. The working head is 40 ft., and the larger tur-

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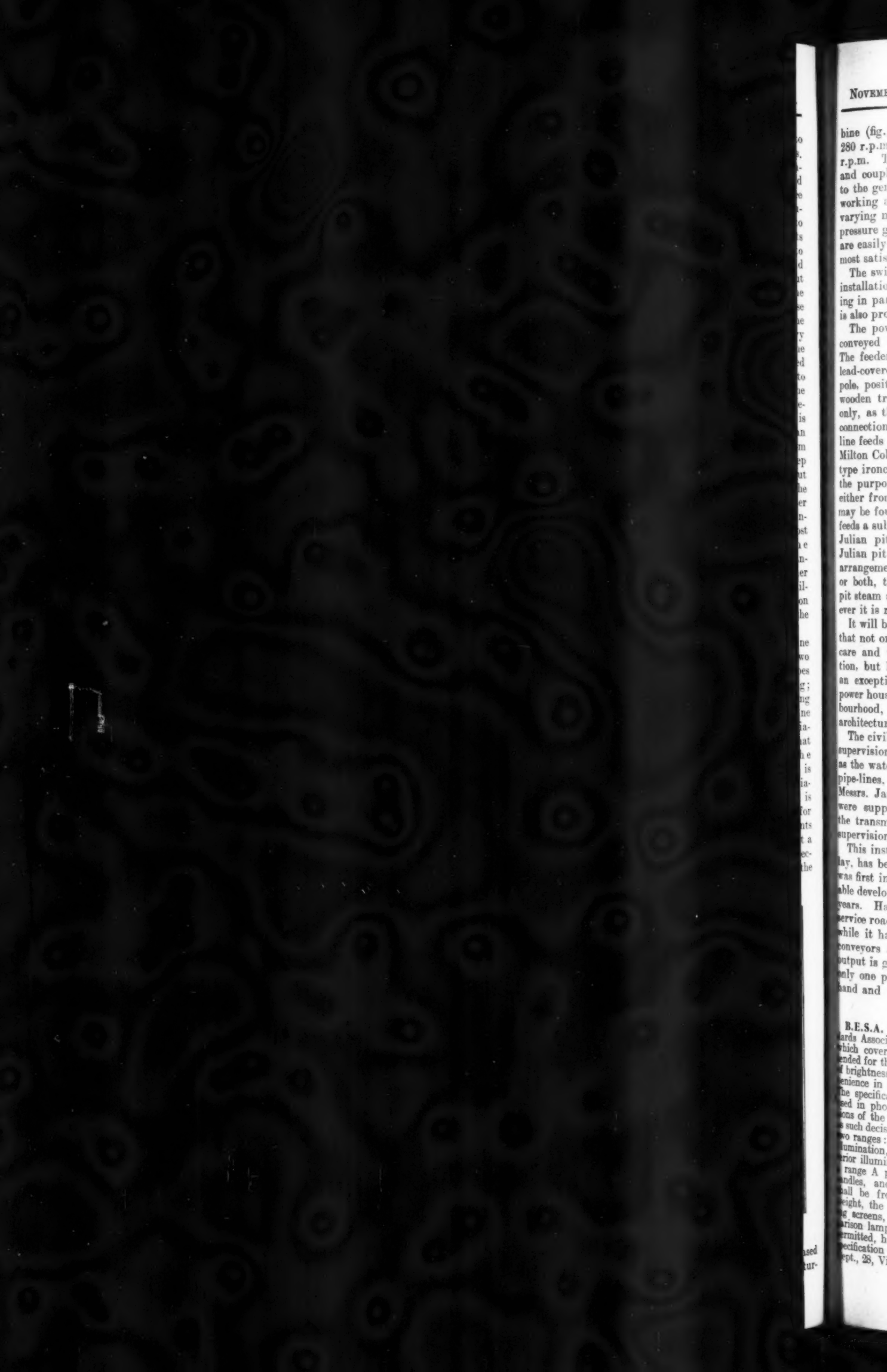


bine (fig. 4) is producing with this head 550 h.p. at 280 r.p.m., the smaller one giving 270 h.p. at 400 r.p.m. The turbines are fitted with cast-iron flywheels, and coupled direct through belt-type flexible couplings to the generators, which are of the direct-current type working at 450 volts. The load is of an exceptionally varying nature, but it has been found that the two oil-pressure governors (one of which is illustrated in fig. 5) are easily capable of taking care of all variations in a most satisfactory manner.

The switchboard embodies the usual equipment for an installation of this kind, which is arranged for working in parallel. A 4-ton overhead hand-operated crane is also provided.

The power generated at the Castle power station is conveyed by underground feeders to overhead lines. The feeders comprise two 1.0-sq. in. paper-insulated, lead-covered, and heavily braided cables in parallel per pole, positive and negative. The feeders are laid in wooden troughing, this being a mechanical protection only, as the feeders pass through fallow ground. The connection to the overhead line forms a "tee," as this line feeds in two directions, one to a sub-station at the Milton Colliery surface workings, where there is mining type ironclad switchgear with change-over switches for the purpose of supplying the Milton mine with power, either from the Milton or the Castle power stations, as may be found most convenient. The overhead line also feeds a sub-station where powder is distributed to the Julian pit and other underground workings. The Julian pit has a large steam generating plant, and the arrangement of the switchgear is made so that either, or both, the Castle water-power station or the Julian pit steam station can supply power wherever and whenever it is required.

It will be noticed from the accompanying illustrations that not only has the Balgonie Colliery Co. taken great care and trouble on the technical side of the installation, but has gone to considerable trouble to produce an exceptionally pleasing exterior of both intake and power house, all in keeping with the surrounding neighbourhood, where the Balgonie Castle dominates the architecture.

The civil engineering work was carried out under the supervision of Mr. W. Proudfoot, of Kirkcaldy, whereas the water-power plant proper, with the turbines, pipe-lines, strainers, &c., were supplied and installed by Messrs. James Gordon & Co., Ltd. The generators were supplied by the English Electric Co., Ltd., and the transmission line work was carried out under the supervision of Mr. R. M. Russell, of Glasgow.

This installation, despite its rather high capital outlay, has been a great commercial success. Electricity was first introduced at Balgonie in 1895, and considerable development has taken place underground in recent years. Haulage motors are in use on the main and service roads, and there is not a single pony in the pits, while it has been found possible to utilise cutters and conveyors at all the faces; in one pit the whole of the output is gotten with the aid of cutters, and in another only one per cent. of the production is obtained by the hand and pick.

B.E.S.A. Specification.—The British Engineering Standards Association has issued a specification (No. 230, 1925), which covers the requirements for portable photometers intended for the measurement of illumination, and in some cases of brightness also, under conditions where portability and convenience in use are of more importance than great accuracy. The specification includes definitions of the principal terms used in photometry, which are in accordance with the decisions of the International Illumination Commission, in so far as such decisions are applicable. It divides the photometers into two ranges: A, those intended for use in measuring exterior illumination, and B, those intended for use in measuring interior illumination. It is specified that the effective range of range A portable photometer shall be from 0.01 to 2 ft. candles, and that that of a range B portable photometer shall be from 0.2 to 20 ft. candles. The questions of weight, the test and comparison surfaces, the use of reducing screens, the electrical measuring instruments, the comparison lamp and battery, and also the limits of error to be permitted, have all been gone into carefully. Copies of the specification may be obtained from the B.E.S.A. Publications Dept., 28, Victoria St., London, S.W.1, price 1s. 2d. post free.

Telegraph and Telephone Notes.

(*Continued from page 738.*)

Costa Rica.—TELEPHONE AGREEMENT.—An operating agreement for the telephone system of San Jose and vicinity was signed by a representative of the Compania Nacional de Electricidad and the President of Costa Rica on August 26th. *Commerce Reports* explains that the company agrees to keep all its present lines in operation should the number of subscribers warrant it, install only modern equipment, and within one year erect a new line connecting Cartago and Alajuela with a branch to Heredia. Within 18 months a new connection must be constructed between San Jose and Puntarenas.

Germany.—TELEPHOTOGRAPHY.—A step forward is claimed to have been made in the speed of transmission and reception of writing and pictures by wireless. The announcement was made at Leipzig on the occasion of the unveiling of a monument to the German physicist Hertz by Dr. Schröter, of the Research Department of the Telefunken Gesellschaft, with whom Dr. Karolus, who is chiefly responsible for the improvements, has been collaborating.—*The Times.*

The Telegraph Conference.—TELEPHONY.—A novelty in telephonic communication, adopted on October 30th at the closing meeting of the Paris International Telegraph Conference, is a system of "lightning" conversations, which will take absolute priority over all other calls. The rate chargeable will be approximately ten times the ordinary tariff. The system, which has already been applied in Scandinavia, will now be made general internationally, though its introduction is not obligatory, and is only applicable by mutual arrangement between the different countries.

Another innovation, accepted by the Conference, is the adoption of a rule that the time taken in excess of the first three minutes, in the case of international telephone calls, shall be charged "per minute" and not "per three minutes," as hitherto, a change which will mean a great saving to users of international telephones.

The Conference also adopted a new feature as regards wireless telegraphy, whereby wireless messages under multiple addresses will be accepted in plain or in code language.—*Reuter* (Paris).

Telegraphists' Strike.—MARCONI OPERATORS.—The following statement was issued on November 3rd by Marconi's Wireless Telegraph Co., Ltd.:—

On October 31st the management at Radio House gave notice to nine telegraphists whose services were no longer required. At 4 p.m. on November 3rd the whole of the telegraphic staff went on strike. The Marconi Co. has no official knowledge whether the strike was caused by the notices given to the nine men or not. During the morning of November 3rd the secretary of the men's union telephoned asking for an interview, as there was likely to be trouble with the Radio House telegraphists. He was told that if he wished to see the manager unofficially, to discuss any grievances the men might have, the manager would be glad to see him, but that any official representations must be made to the Engineering and Allied Employers' London and District Association. So far as the Marconi Co. is aware, no approach was made to the Federation, and the men came out on strike without any notice.

The Telephone Service.—NEW AUTOMATIC EXCHANGES.—The first towns in the South-West of England to have the automatic telephone system installed are Torquay and Paignton, where the change was made on Saturday. The formal opening ceremony took place on Monday, when the Mayor officially inaugurated the new system and inspected the plant at the head post office. The telephone kiosks in various parts of the two towns are to be provided with a new type of coin box, with slots for shillings and sixpences as well as pennies, thus allowing calls of any distance to be effected.

United States.—GOVERNMENT RADIO SERVICE.—The maze of wires formerly used by the Government has been supplanted by a network of radio stations manned by Army and Navy *personnel* and transmitting messages not only to the two military arms, but to other Government departments as well. About two million words in Government messages are radiated monthly from Washington, through Army and Navy stations. Until recently about half of the Government's messages were dispatched over commercial lines, and radio not only has expedited and effected economy in communication, but its wide use, says *T. & T. Age*, has served to train a large force and erect a system that would be highly valuable in the event of war. The Navy sends and receives an average of more than one million words monthly by radio, its own leased land wires, and through commercial companies. Of this, little more than one-fifth is now transmitted by private concerns, with radio handling the larger part. Development during the past year of short-wave sending has considerably increased the Navy's capacity for handling messages, and when the battle fleet was in the antipodes recently two-way short-wave communication was readily established with Washington. The War Department has established a net of 60 radio stations, and it undertook its first great expansion of the use of radio for departmental business at the beginning of the fiscal year 1923 and transmitted through its stations that year less than 4,000,000 words. In the fiscal year 1925, ending last July, nearly 8,500,000 words were transmitted.

Radio Notes.

Germany.—LICENCES.—A considerable reduction in the number of German broadcasting subscribers is announced, and according to *The Times*, the Post Office officials whose duty it is to collect the fees are urged to greater efforts, the official view being that the decrease is more probably due to "licence-fatigue" than to lack of interest in the broadcast programmes. Severer measures against the owners of unlicensed receiving sets are also hinted at. Proceedings against "black-hearers," as they are called in Germany, have always been a feature of German broadcasting, and periodic announcements are made of convictions, the appeals to the dilatory usually ending with a reminder of the smallness of the fee. It is at present 24 marks (£1 4s.) per annum.

Japan.—"DUMPING" TARIFF.—Manufacturers of the cheaper grades of wireless apparatus in the United States and Great Britain, particularly the former, are to find the Japanese market closed to them in the near future, if the plan of the Finance Department materialises, which the *Daily Mail* thinks is certain. This plan is to include all wireless materials and parts under the "luxury tariff" enacted a year ago, which imposes an import duty of 100 per cent. Recently American wireless material has been imported in great quantities. There are now 70,000 subscribers in Tokio to the broadcasting service, and it is expected that this number will be doubled by the end of the year.

Latvia.—NEW STATION.—The construction of the two towers for the radio broadcasting station at Riga has been completed, and it is expected that the station will be in operation shortly. *Commerce Reports* believes that the Latvian postal administration will not monopolise the future radio business in Latvia as originally planned.

Licences.—DEMAND CONTINUES.—The latest figures issued by the Post Office show that at the end of September 1,464,500 licences had been issued. This figure shows an increase of 41,500 over the figure for the end of August, which was 1,380,000. At the end of September, 1924, the number was 998,607.

New Studio.—OXFORD.—A new studio has been fitted up by the British Broadcasting Co., Ltd., in Magdalen Street, Oxford, and will be opened on November 26th. It is understood that it will be used for broadcasting events connected with Oxford and University life from time to time.

Peru.—LICENCES.—The Government of Peru is to enforce the provisions of the wireless law calling for the inspection of all radio installations and the collection of a tax of one Peruvian pound for each receiving set in use. The general administrator of mails, telegraphs, and wireless is intrusted with the assessment and collection of this tax, together with the establishment and maintenance of a registry of all sets in use.

United States.—RADIO ANTI-TRUST INQUIRY.—The United States Federal Trade Commission has begun hearings in New York in an investigation of the methods and practices of the Radio Corporation of America. According to the *Manchester Guardian*, Mr. David Sarnoff, vice-president and general manager of the Corporation, issued a statement the day before hearings commenced, in which he said that his company welcomed the investigation.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Australia.—MELBOURNE.—December 15th. Postmaster-General's Department. Junction apparatus for manual exchanges.*

December 29th. Magnet and resistance wire.*

Barking.—January 1st. County of London Electric Supply Co., Ltd. Water-tube boilers with mechanical stokers or powdered fuel equipment, steam turbo-alternators, condensing plant, and auxiliary apparatus for the Barking power station. (October 30th.)

Belgium.—November 25th. Belgian Post and Telegraph authorities at La Salle Madeleine, Brussels. Supply and laying of telephone cables at Soigmies, La Bouverie, and Profondeville. Particulars (Cahier des Charges Special No. 3-146) for 6 fr. 65 c.

Birkenshaw (Yorkshire).—November 17th. Installation of electric light in 22 houses on the District Council's housing estate at Old Lane. Mr. Ralph Brooks, Council Offices.

Bradford.—November 14th. Tramways Committee. General stores required during year commencing January 1st, 1926. Particulars from Mr. R. H. Wilkinson, general manager, 7, Hall Ings, Bradford.

Carlisle.—November 19th. Electricity Department. L.p. cast-iron piping for condensing water system. (October 30th.)

Dublin.—November 12th. Great Northern Railway (Ireland). Stores for six months (including electrical fittings, lamps, cable, and wire, &c.). (October 23rd.)

India.—BOMBAY.—November 11th. Bombay, Baroda and Central India Railway. D.c. motors and starting pillars. (October 30th.)

DELHI.—November 30th. Indian Stores Department. Substation equipment for Jaipur (comprising insulators, wire, l.p. cable, switchgear, transformer, &c.).*

Kingston-upon-Hull.—November 16th. Electricity Department. Two natural draught cooling towers. (October 30th.)

London.—LONDON COUNTY COUNCIL.—November 16th. Reconstruction of electrical switchgear at Shoreditch substation. (October 30th.)

New Zealand.—WELLINGTON.—December 15th. Post Office Stores Department. Key switches.*

Oldham.—November 21st. Electricity Department. Three 12,500-kW turbo-generators and auxiliary plant. (October 30th.)

December 5th. Eight water-tube boilers, with superheaters, chain-grate stokers, steel chimneys, and induced draught plant. (See this issue.)

Pentre (Glam.).—November 16th. Rhondda Urban District Council Electricity Department. Two 35-h.p. and one 20-h.p., 400-V, squirrel-cage induction motors. (See this issue.)

Richmond (Yorks.).—Town Council. Electrical plant and material for electricity scheme. Specifications from Mr. W. W. Foster, town clerk, Corporation Offices.

South Africa.—JOHANNESBURG.—December 4th. Electricity Supply Commission. Plant and material for transmission lines and sub-stations in connection with the supply of electricity in the Cape area rural districts.

December 23rd. Union Tender Board. Telephone apparatus and supply of telegraph material for the Department of Posts and Telegraphs.—*S.A. Mining and Engineering Journal.*

CAPE TOWN.—December 3rd. Electricity Department. Three-phase induction voltage regulators.*

FORT BEAUFORT.—December 10th. Municipal Council. Generating plant and materials for electric lighting.*

QUEENSTOWN.—January 7th, 1926. Municipal Council. Extensions to the electricity undertaking.*

Uruguay.—MONTEVIDEO.—January 5th. State Electricity Supply Works. Bare copper wire, quicksilver.*

January 11th. 96,000 metres lead-covered wires and cables.*

January 12th. 44,500 metallic and carbon-filament lamps.*

January 18th. 170,000 metres of r.i. cords.*

Administration Nacional del Puerto de Montevideo. January 2nd. Machine tools and equipment.*

West Ham.—November 16th. Education Committee. Installation of electric lighting and central heating at the Cumberland Road new secondary school. (October 23rd.)

York.—November 12th. Electricity Department. One 6,000-kW, 3-phase turbo-alternator, with condensing plant, pipework, &c. (October 23rd.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Barrow.—The Council has adopted the Electricity Committee's recommendation to purchase six sets of switchgear from the Swedish General Electric, Ltd., at £13 10s. per set. It was stated that the British firms quoted £40 per set, but the Swedish apparatus was very much lighter than the British, though efficient for the purpose required.

Belgium.—The Belgian Post and Telegraph authorities in Brussels last week placed some large contracts for miscellaneous telephone material with the Bell Telephone Manufacturing Co., the New Antwerp Telephone Co., of Antwerp, and the Société Electrique et Mecanique, of Brussels.

Birmingham.—Education Committee. Accepted:—
Installation of electric light in the Domestic Subjects Centre at Harborne.—E. Hill & Sons.

Bradford-on-Avon.—Urban Council. Accepted:—
Installing electric light at the Baths.—Rossiter & Co.

Burnley.—Electricity Committee. Accepted:—
360 yds. of conduit (£123).—J. & R. Howie, Ltd.
2,025 yds. of cable (£1,001).—P. E. Bantling, Ltd.

Chesterfield.—Town Council. Accepted:—
Cable extensions.—W. T. Glover & Co., Ltd. (£379); Western Electric Co., Ltd. (£310).

Erith.—Urban Council. Accepted:—
Two lots of cable (£358 and £552 respectively).—Callender's Cable and Construction Co., Ltd.

London.—ST. MARYLEBONE.—Electric Supply Committee. Recommended:—
Two e.h.p. truck-type cubicles (£172).—Ferguson, Pailin, Ltd.

DEPTFORD.—Town Council. Accepted:—
Electrically-driven vertical centrifugal pump for Laurie Grove baths (£770).—Worthington, Simpson, Ltd.

Manchester.—Baths and Wash-houses Committee. Accepted:—
Installation of electric light at Mayfield baths.—R. H. Clampett & Co.

Education Committee. Accepted:—
Electric lighting installation, Longsight Municipal school.—R. Seddon and Sons.
Rearrangement of the electric lighting installation, Burgess Street school.—Ward & Booth.

Electricity Committee. Accepted :—
Cable trenching, capping and boards.—Burt, Boulton & Haywood, Ltd.; Hall Bros. Timber Co., Ltd.
One 10 ton hand-operated crane for Burnage sub-station.—H. Morris, Ltd.
Switchgear, Hetherington & Sons' sub-station.—Ferguson, Pailin, Ltd.

Gas Committee. Accepted :—
Overhauling and maintenance of telephone installation (Bradford Road).—L. E. Wilson & Co.

Morecambe.—Electricity Committee. Accepted:—
H.p. cable.—W. T. Glover & Co., Ltd.

Oldham.—Tramways Committee. Accepted:—
12 tramcars.—English Electric Co., Ltd.

Electricity Committee. Accepted :—
Meter boards.—C. Schofield & Co., Ltd.
Switchgear.—Ferguson, Pailin, Ltd.

Preston.—Corporation. Accepted:—
Supply of a third turbo-generator (£30,257) for the new Ribble power station.—English Electric Co., Ltd.

South Africa.—DURBAN.—Electricity Department. Accepted :—
3 miles cable (£2,435); 10 tons bare copper wire (£944); fuses (£187); stay rods (£71).—T. Barlow & Sons, Ltd.
6 miles cable (£2,327).—Bartle & Co., Ltd.
One automatic synchroniser (£164).—British Brown, Boveri, Ltd.—*S.A. Mining and Engineering Journal.*

SOUTH AFRICAN RAILWAYS.—*The Times* states that the Metropolitan-Vickers Electrical Co., Ltd., has secured a large repeat order, upwards of a quarter of a million pounds in value, for 17 more combined passenger and freight locomotives with spares, similar to the 78 supplied by the company in 1922, and put into commission during the last two years, in connection with the electrification of the South African Railways.

Spain.—SPANISH ELECTRIFICATION CONTRACT.—The Santander-Bilbao Railway Co. has awarded the contract for the electrification of the line between Bilbao and Las Avenas to the Allgemeine Elektrizitäts Gesellschaft. Contracts for the motors and certain accessories remain to be awarded, and tenders will be invited very shortly.—*Reuter's Trade Service* (Madrid).

Stafford.—Electricity Committee. Accepted:—
Construction of circulating-water ducts.—Mitchell Conveyor and Transporter Co., Ltd.

Tynemouth.—Electricity Committee. Accepted:—
Wiring houses under assisted scheme.—J. E. Robinson.

Forthcoming Events.

Institution of Electrical Engineers.—INFORMAL MEETING.—Monday, November 9th. At the Institution, Victoria Embankment, W.C. At 7 p.m. Discussion on "Modern Developments of Telephone Cables," to be opened by Mr. E. S. Ritter.

(Irish Centre) (Dublin).—Thursday, November 12th. At Trinity College, Dublin. At 7.45 p.m. Paper on "Underground Telephone Construction," by Mr. G. G. Sutcliffe.

(North-Eastern Centre).—Monday, November 9th. At Armstrong College, Newcastle-on-Tyne. At 7 p.m. Paper on "Dielectric Problems in High-Voltage Cables," by Mr. P. Dunsheath.

(North-Midland Centre).—Tuesday, November 10th. At the Hotel Metropole, Leeds. At 7 p.m. Address by the chairman, Mr. S. Derwen Jones, and smoking concert.

(Scottish Centre).—Tuesday, November 10th. At the Royal Technical College, Glasgow. At 7.30 p.m. Address by the chairman, Prof. M. Maclean.

(South-Midland Centre).—Wednesday, November 11th. At the University, Birmingham. At 7 p.m. Paper on "The Development of Alloys of Nickel and Chromium for High-Temperature Work and Electrical Resistance Heating," by Mr. W. R. Barclay.

(Dundee Sub-Centre).—Thursday, November 12th. At the University College, Dundee. At 7.30 p.m. Paper, "A Comparison of Electrical Wiring Installations and Analysis of their Costs," by Mr. I. Sclar.

(North-Western Centre) (Students' Section).—Tuesday, November 10th. At Milton Hall, Deansgate, Manchester. At 7.30 p.m. Paper on "The Design of Current Transformers," by Mr. C. T. Melling.

(London Students' Section).—Friday, November 13th. At the Institution, Victoria Embankment, W.C. At 6.15 p.m. Opening address by Lt.-Col. K. Edgcumbe, R.E. (T.A.).

Nottingham Society of Engineers.—Monday, November 9th. At the Victoria Station Hotel. At 7.30 p.m. Lecture on "Automatic Machines," by Mr. L. Cord.

Association of Mining Electrical Engineers (London Branch).—Tuesday, November 10th. At the Engineers' Club, Coventry Street, W. At 6.30 p.m. Presidential address by Mr. J. W. Gibson.

Institution of Engineering Inspection.—Friday, November 13th. At the Royal Society of Arts, John Street, Adelphi, W.C. At 7.30 p.m. Paper on "Modern Developments in Steels Resistant to Corrosion," by Mr. W. H. Hatfield.

Junior Institution of Engineers.—Friday, November 13th. At 39, Victoria Street, S.W. At 7 p.m. Annual general meeting.

Birmingham Electric Club.—Friday, November 13th. At the Grand Hotel, Colmore Row. At 7 p.m. Lecture on "Submarine Cable Manufacture and Laying," by Mr. H. G. Wood.

Physical Society of London.—Friday, November 13th. At the Imperial College of Science, South Kensington, S.W. At 5 p.m. Ordinary scientific meeting.

Finsbury Technical College Old Students' Association.—Saturday, November 14th. At the Engineers' Club, Coventry Street, W. At 6.30 p.m. Annual dinner.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names of makers or suppliers of :—

THEOLIGHT DYNAPOCKET lamps and cycle sets.

Notes.

Power Station Visit. — The Halifax Corporation power station was visited last week by some 200 employés of Messrs. John Crossley & Sons, Ltd., carpet manufacturers, of Dean Clough Mills. The party was divided into groups and conducted over the works by members of the staff, who explained details of the plant and its working. The visit was organised by the Dean Clough Mills Welfare Society, and hearty thanks were accorded the borough electrical engineer (Mr. W. M. Rogerson) and the members of the staff.

The 1926 Municipal Tramways Association Conference.—Liverpool City Council has invited the Municipal Tramways and Transport Association to hold its next annual conference in Liverpool.

Manchester Wireless Exhibition.—Over ninety firms exhibit in the second annual Manchester Wireless Exhibition (October 27th to Nov. 7th). The opening ceremony was performed by Capt. P. P. Eckersley, and the exhibits comprise everything from a cat's-whisker to a wireless-equipped lifeboat, the White Star Line having loaned a boat from the steamer *Baltic*. Messrs. Franks, Ltd., wireless dealers, of Manchester, have organised a £100 competition, by which they are seeking to discover the most popular types of loud speakers, receivers, and components. Another ballot competition was run by the exhibition authorities to determine which stands, in the opinion of the public, were the most interesting and attractive. The first prize was an eight-valve heterodyne receiver valued at £60, presented by Messrs. H. Clarke & Co., Ltd., Manchester; second prize, a two-valve amplifier and loud speaker valued at £30, presented by the Western Electric Co., Ltd., London; and the third prize, a Burndept Ethophone No. 3, valued at £25, presented by Mr. W. C. Barraclough, Manchester.

R.N.D. Engineers' Dinner.—The seventh annual dinner will be held on Friday, November 13th, at the London Tavern, 53, Fenchurch Street, E.C., at 6.30 p.m. for 7 p.m. On this occasion Nos. 1, 2 and 3, Field Companies, Signal Co. and Depôt Co. will dine together. Tickets (6s.) are obtainable from Mr. J. N. Robertson, 14, Woodgrange Avenue, Ealing Common, W.5. 'Phone: Ealing 2779.

London Electrical Engineers.—27th (London) Anti-Aircraft Battalion R.E. (T.A.). Officer Commanding: Lt.-Col. C. H. S. Evans, O.B.E.

The following orders have been issued for November :—

305th Company (Major A. W. M. Mawby, O.B.E., A.M.I.E.E.).—Tuesdays, 7 p.m. to 9.30 p.m.: Special instruction for officers, non-commissioned officers, and men for promotion.

306th Company (Major F. C. Clarke, A.M.I.E.E.).—Mondays, 7 p.m. to 9.30 p.m.: Special instruction for officers, non-commissioned officers, and men for promotion.

The headquarters at 46, Regency Street, London, S.W.1, will be open until 8 p.m. on week-days (11 p.m. on Mondays and Tuesdays), and 1 p.m. on Saturdays. All social arrangements for the year will be under Major W. H. Merrett, T.D., and the sports officer is 2nd-Lieut. T. H. R. H. Jolly.

Appointments Vacant.—Junior mains engineer for the Electricity Supply Department of Pooley Hall Colliery. Station superintendent and constructional draughtsman for the City and County of Bristol Electricity Department. Travelling meter inspectors for the Electrical Apparatus Co., Ltd. Plumber-jointer for the Hazel Grove and Bramhall U.D.C. Electricity Department. (See our advertisement pages to-day.)

Earthing the Neutral.—Referring to the efforts of wireless amateurs to operate their sets with current from the mains, Mr. James Nelson writes pointing out that it is forbidden by the electricity regulations to earth the neutral of a system at more than one point, and that persons trying to charge accumulators by connecting a battery between the earthed main and, for instance, a water pipe, would render themselves liable to prosecution. The lighting mains, when used in conjunction with a wireless set, should never be earthed except through a condenser robust enough to withstand the full voltage of the supply to earth.

An Institute of Wireless Engineers.—A meeting was held at the Hotel Russell, London, on October 31st, for the purpose of considering the formation of an institution to cater for the wireless engineer.

Mr. C. E. Baldwin presided, and said the object of those who started this movement was to co-operate with the existing institutions, and at the same time do work which was not done by them.

Mr. W. Y. P. Evans, of Manchester, who has been acting as secretary, regretted that the Institution of Electrical Engineers found it impossible to state a definite policy with regard to the aims of those who were behind this movement. One of the difficulties of the Institution of Electrical Engineers was that it obviously could not reduce the status which it had already established for those desiring to become members, and the result was that although the I.E.E. catered for the advanced wireless engineer, it did not encourage the junior or regularly employed wireless engineer. A certain section of wireless engineers

were not particularly keen on joining the I.E.E. because by doing so they became chartered electrical engineers—which they did not desire to be. On the other hand, Mr. Evans continued, the Radio Society had acted in a very straightforward manner by stating that its policy was to cater only for the amateur. Thus, there was a gap between the work which the Radio Society of Great Britain was doing and that which the Institution of Electrical Engineers did through its Wireless Section.

The chairman, in the course of subsequent remarks, stated that as the result of correspondence with wireless engineers all over the world, 50 had already expressed a wish to join some institution for wireless engineers, and contributions had actually been sent in amounting to £216. The fact that there were something like 500 members of the American Institute of Radio Engineers in this country indicated that there was ample room for a body such as that now proposed.

Mr. Evans said that one of the things which it was felt ought to be remedied was that a man in charge of a 10-kW Government station was considered merely as an operator and not as a wireless engineer. One of the tasks of the new body, if formed, would be to deal with such matters and endeavour to raise the status of such men by giving some hall-mark to their abilities. The people whom it was desired to bring together consisted, for the most part, of men who were really debarred from joining the Institution of Electrical Engineers.

A resolution was unanimously passed that a new body should be formed, and it was decided to call it the Institute of Wireless Engineers. A committee was formed to carry out the necessary preliminary work with a view to the preparation of the articles of association, Mr. W. Y. P. Evans, of 2, Parkside Road, Princes Road, Moss Side, Manchester, being elected secretary. It is the intention to have the headquarters of the Institute in London.

The Birmingham Electric Club.—The ladies' night of this club, held on October 23rd, at the Grand Hotel, Colmore Row, Birmingham, was very successful, about 450 persons being present. This being the 21st anniversary of the club, a special feature was made of the electrical decorations, which included electrically-illuminated signs reading: "1904-1925." The Grosvenor ballroom was tastefully garlanded with smilax, palms, and chrysanthemums, and whilst dancing proceeded to the strains of Messrs. Priestley's Band, coloured lights were played upon the dancers from the balconies. A whist drive was patronised by a number of guests until 10 p.m., when there was one hour's interval for supper, during which speeches of welcome were delivered by the President, Mr. F. R. Unwin, M.I.E.E., to Mr. W. Smith, and Mr. E. A. Morgan, two of the founders of the club, and also to Mr. R. A. Chattock, city electrical engineer, congratulating him on his election as president of the Institution of Electrical Engineers. After supper dancing was resumed until 2 a.m., when the company surrounded the President and Mrs. Unwin and with joined hands sang "Auld Lang Syne."

Tyne Electrical Engineers' Dinner.—The officers of the Tyne Electrical Engineers, R.E., held their annual re-union dinner at Newcastle-on-Tyne, on Saturday, October 24th. The gathering was well attended by past and present officers of the unit, who spent a very enjoyable evening. Following the loyal toast, Lt.-Col. A. K. Tasker proposed the health of the Tyne Electrical Engineers. The commanding officer, Brevet-Col. Ernest Robinson, C.B.E., replied, and outlined briefly the present activities of the unit. He mentioned that a very satisfactory report had been made by the inspecting officers of the last camp. With regard to the successes obtained this year at the Northumberland Rifle Association meeting, the Tyne Electrical Engineers had won over 30 per cent. of the prize money. The unit had also carried away 16 of the 44 medals awarded, and three of the 10 challenge cups. The coveted Chipchase Cup had again, for the sixth time in succession, been won by a member of the Tyne Electrical Engineers, which had the distinction of possessing the competitor who had made the highest aggregate score. Since the last re-union dinner two challenge cups in respect of technical work had been presented for annual competition amongst the sections of the unit. Major Forster proposed the health of the retired and attached officers. Replying on behalf of the retired officers, Lt.-Col. S. E. Monkhouse said it was with very much pride that they watched the achievements of the Tyne Electrical Engineers, and he hoped it would not be long before the authorities recognised their efforts by granting them a larger establishment. Major N. H. Firmin, O.B.E., proposed a toast to Col. Robinson, and said it was a great honour to the Tyne Electrical Engineers that the C.O. should have had the C.B.E. conferred upon him. Replying to the toast, Col. Robinson said it was to him a source of very much regret that he would no longer remain on the strength of the unit.

Fatalities.—W. J. Wainwright (27), an electrician employed at the Barugh works of the Yorkshire Electric Power Co., was killed recently in the works at a switch which he had been repairing. It appears that after effecting the repairs he asked the charge engineer to switch on. The engineer received the signal that everything was right and put on the current. On receiving no reply he went to see whether anything was wrong, and found Wainwright lying near the switch, face downwards. Artificial respiration was tried without success.

An inquest was held at Hayle (Cornwall) last week into the death of Richard James, an overhead linesman in the employment of the Cornwall Electric Power Co. It was stated that James, in company with two other linesmen, was examining the line through Hayle to Camborne for a cracked insulator, when James fell from the telephone arm of a pole, a distance of 21 ft., fracturing his skull. William Wills, the foreman, said that James could not have got in contact with a live wire, and he could only account for his fall by seizure with sudden illness. Evidence was given by Mr. A. C. Owen, of Camborne, distribution engineer to the Electric Power Co., and a doctor testified to the fact that there was no evidence that deceased had received an electric shock. The Coroner returned a verdict of "Accidental death."

London Traffic Inquiry.—The inquiry by a sub-committee of the London Traffic Advisory Committee into the traffic facilities of North London was re-opened on November 2nd. A report was submitted by Mr. J. K. Bruce, general manager of the L.C.C. tramway undertaking, giving details of the tramway service at Finsbury Park tube station. The inquiry is to be resumed to-day.

Institution Notes.

Institution of Electrical Engineers.—SOUTH-MIDLAND STUDENTS' SECTION.—At the meeting on Tuesday last, a paper was to be read by Mr. J. T. Allen on "A Study of the Difficulties in the Application of Electricity to Farming."

PROGRAMMES.—The arrangements for the first part of the 1925-26 session include the following provincial items:—

IRISH CENTRE (DUBLIN).

November 12th.—Mr. G. G. Sutcliffe. "Underground Telephone Construction."
December 10th.—Mr. J. Lindsay. Lecture on "The Mechanical Winning of Peat."
January 21st, 1926.—Mr. A. P. Trotter, B.A. Faraday Lecture on "Illumination and Light."

MERSEY AND NORTH WALES (LIVERPOOL) CENTRE.

November 16th.—Mr. T. Carter. "The Engineer: His Due and His Duty in Life."
December 14th.—Mr. E. H. Shaughnessy, O.B.E. "Post Office Wireless Stations."
January 18th, 1926.—Mr. A. P. Trotter. Faraday Lecture on "Illumination and Light."

NORTH-EASTERN CENTRE.

November 9th.—Mr. P. Dunsheath. "Dielectric Problems in High-Voltage Cables."
November 23rd.—Mr. T. Carter. "The Engineer: His Due and His Duty in Life."
December 14th.—Lt.-Col. K. G. Maxwell and Mr. A. Monkhouse. "Recent Improvements in the Insulation of Electrical Machinery."

SOUTH-MIDLAND CENTRE.

November 10th.—Mr. S. Derwen Jones. Chairman's address (followed by a smoking concert).
November 24th.—Mr. T. Carter. "The Engineer: His Due and His Duty in Life."
December 8th.—Prof. S. P. Smith. "An All-Electric House."

NORTH-WESTERN CENTRE.

November 17th.—Mr. P. Dunsheath. "Dielectric Problems in High-Voltage Cables."
December 1st.—Mr. T. Carter. "The Engineer: His Due and His Duty in Life."
December 15th.—Prof. S. P. Smith. "An All-Electric House."
January 19th, 1926.—Mr. A. P. Trotter. Faraday Lecture on "Illumination and Light."

SHEFFIELD SUB-CENTRE.—The opening meeting and smoking concert of the season of the Sheffield Sub-Centre of the Institution was held last week, when Mr. W. F. Mylan was installed as chairman. In his speech, Mr. Mylan made a strong appeal for increased membership; in 1921 the Sub-Centre had a membership of 73, which had increased to 167, but there still remained many electrical engineers in the district who were not members of the Institution. The membership of the Students' Section had increased in five years from 36 to 52.

SCOTTISH CENTRE.—The 25th annual report of the Committee of this Centre shows that 10 meetings were held during the 1924-25 session at which the average attendance was 75, and the session ended with a total membership of 652, a decrease of six as compared with the previous year. The two informal meetings held in Glasgow were very successful.

SCOTTISH STUDENTS' SECTION.—The seven meetings and five works visits of this Section were considerably in excess of those of past years, and it is hoped to develop this Section in the future. The average attendance at meetings was 32.

DUNDEE SUB-CENTRE.—The attendance at the six meetings of this Sub-Centre averaged 24; the membership at the close of the session totalled 59.

Electrical Society of Glasgow.—The following are the arrangements for the 1925-26 sessions:—

December 1st.—"Wiring Systems." Mr. T. S. Seymour.
January 6th.—"Wiring Rules and Defects." Mr. H. M. Stronach.
February 2nd.—"Internal Combustion Engines." Mr. A. H. Crowther.
March 2nd.—"Industrial Heating Appliances." Mr. P. J. Sims.

Royal Institution.—At a general meeting on Monday last, the special thanks of the members were returned to Professor Percy Frankland for his gift of a number of relics of Faraday.

Institution of Heating and Ventilating Engineers (Inc.).—At the meeting on November 4th, Mr. J. J. Lassen dealt with the installation of heating plant, pointing out that some kind of instrument should be available to enable the attendant to watch the firing. When examining the performance

of any heat-producing plant in detail, a proper heat balance sheet must be compiled in order to ascertain the efficiency of the plant. Carbon dioxide recording instruments were formerly constructed far too much by chemists, who did not fully realise the rough working conditions in the average stokehold; but with modern plants far greater attention had been paid to the mechanical details so that they now had instruments which would stand years of hard work.

Junior Institution of Engineers.—At a meeting of the Institution held on October 30th, a film was shown illustrating the construction and assembly of the 50,000-kW turbo-alternator recently supplied by Messrs. C. A. Parsons & Co., Ltd., for the power station of the Commonwealth Edison Company of Chicago. Mr. G. S. Prest made some preliminary remarks on the features of the design of the machine, and summarised the improvements over existing practice which were expected to be obtained. There was a record attendance of members and visitors.

Institute of Transport.—ELECTRIC TROLLEY 'BUSES.—Mr. Frank Ayton, in his recent paper before the Institute, at Liverpool, urged the points of superiority of the electric trolley 'bus over the petrol motor 'bus. "The running cost per mile of the trolley 'bus is," he said, "1.46d., as opposed to 2.47d. for the petrol 'bus. Trolley 'buses can easily be employed for carrying goods and for handling such a transport service from town to town if necessary."

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.)

The accompanying portrait is of Mr. W. F. MYLAN, who is chairman of the Sheffield Sub-Centre of the Institution of Electrical Engineers. Mr. Mylan was born in Edinburgh in 1881; he was educated privately and at the University College, Sheffield. In 1903 he joined the Sheffield staff of the British Westinghouse Co., and was then for a time engaged on testing for the company at Trafford Park. He returned to Sheffield in 1906 and shortly afterwards was appointed district manager. Mr. Mylan held this position until 1919, when with Mr. G. H. Smith, who was also with the British Westinghouse Co., he formed a company under the title of Mylan & Smith (Engineers), Ltd. Mr. Mylan's connection with the Institution has been a long one and he took an active part in the formation of the Sheffield Sub-Centre. From its inception he acted as treasurer until he relinquished this task to become chairman. Mr. Mylan was a footballer for many years, but his spare-time energy is now employed in golf and tennis. During the war he was an officer in the Yorks. and Lancs. Volunteers.

Mr. W. F. Mylan,
Chairman of the Sheffield Sub-Centre of the I.E.E.

Mr. W. HAMMOND SMITH has recently joined the staff of Messrs. H. J. Packer, Ltd., Bristol, as chief engineer.

Mr. S. DERWEN JONES, whose portrait accompanies this note, is chairman of the North Midland Centre of the Institution of Electrical Engineers for the current session. He was born in Manchester in 1866, and after working in several steam engineering works and tool shops, he studied electrical and mechanical engineering at the Manchester Municipal Technical School. One of his first jobs was the erection and starting of its first a.c.-d.c. battery sub-station for the Salford Corporation. Later Mr. Derwen Jones entered the service of the Bristol Tramway Co., Ltd., as assistant engineer, and from there he went to Doncaster as chief assistant electrical engineer during the period of the inauguration of the town's electric tramways. He was then appointed borough electrical engineer of Batley, a position which he still holds. In the course of his service with the Batley Corporation he has been solely responsible for a number of extensions, including the installation of a 3-phase system.

Mark E. Mitchell & Co.] *[Harrogate*

Mr. S. Derwen Jones,
Chairman, North Midland Centre, I.E.E.

Mr. H. E. YERBURY, deputy manager of the Sheffield Electric Supply Department, at his installation last week as President of the Sheffield and District Section of the Junior Institution of Engineers, gave an address on "The Application of Metaphysics to Science and Engineering."

Mr. E. G. BEATON, acting electrical station engineer at Devonport dockyard, is replacing Mr. J. S. P. Willcocks, serving in a similar capacity at Portsmouth dockyard, he having been transferred to Devonport.

We regret to learn from the newspaper Press that Sir J. S. HARMOOD BANNER, Bt., is lying seriously ill at his residence, Ingmire Hall, Sedbergh, having had a relapse.

Mr. EDWARD D. KILBURN, Vice-President and General Manager of the Westinghouse Electric International Co., and Mr. WALTER S. RUGG, General Sales Manager of the Westinghouse Electric and Manufacturing Co., were named vice-presidents of the latter company at a recent meeting of the board of directors in New York.

Mr. D. E. BELL, general manager and engineer of the West Riding Electric Tramways Co., Ltd., has accepted the appointment of manager to the St. Helens Corporation tramways.

Mr. W. M. CITRINE, who has been appointed acting secretary of the Trades Union Congress, is an electrician by trade and for many years was district secretary of the E.T.U., at Liverpool.

Writing in one of the Leicester papers, Mr. H. PARSONS, managing director of Messrs. Gent & Co., Faraday Works, Leicester, mentions that some of the staff who assisted Mr. J. T. Gent in his telephonic experiments fifty years ago are still with the firm, as is also the assistant who actually made the telephonic apparatus for the Leicester Thorpe Street experiment in 1877. Mr. J. T. Gent first introduced electric light to Leicester with an arc light, on the grand stand of what is now known as Victoria Park, in 1882, the occasion being the visit of the Prince and Princess of Wales to Leicester.

Mr. R. C. BULLOUGH, for 21 years manager of the Colchester Tramways, has been presented with a gold albert by the employés on his retirement from the position.

Mr. ARTHUR FODEN has been appointed shift engineer by the Southport Town Council.

On the evening of October 27th, at the Grand Hotel, Birmingham, a complimentary staff dinner was given to Mr. R. A. CHATTOCK, M.I.E.E., city electrical engineer, to commemorate his election as President of the Institution of Electrical Engineers. Those present included the Lord Mayor of Birmingham, the Town Clerk, Sir David Brooks, Councillor

Beale, chairman of the Electric Supply Committee, Alderman Burman, M.P., Alderman Jephcott, M.P., and other members of the Electric Supply Committee, and over 160 members of the staff, including ladies. The secretary of the department, Mr. E. J. Jennings, Assoc. I.E.E., who was in the chair, referred to the remarkable growth of the department and said that they were out to give a great public service at as low a cost as possible. He referred to the output and other records which were constantly being broken, and he paid a tribute to Mr. Chattock as a distinguished electrical engineer, as a departmental administrator, and as an impartial and tactful chief. Mr. Frank Forrest, M.I.E.E., M.I.M.E., chief assistant electrical engineer, who proposed the toast "Our Guest," said that it was a source of great pride to all engaged in electrical undertakings, particularly on the municipal side, to know that the great Institution of Electrical Engineers, with its 12,000 members, had come to Birmingham this year for its president. The Lord Mayor of Birmingham, in supporting the toast, spoke most appreciatively of Mr. Chattock's work in Birmingham, and gave statistics showing the continuous and abnormal growth of the undertaking under his guidance. Since 1903, when Mr. Chattock came to Birmingham, the gross revenue had increased from £67,278 to £1,250,000; the number of 60-watt lamps connected from 84,193 to 721,337; h.p. of motors connected from 1,175 to 216,558; capital expenditure from £588,323 to £5,621,657. During the same period £2,166,386 of borrowed capital had been repaid. He said they were proud to think that Birmingham had been honoured by sending the first municipal electrical engineer to act as President of the Institution of Electrical Engineers. Councillor Beale said that he did not think anyone had seen a greater development in a municipal trading department than had taken place in the Birmingham Electric Supply Department. Mr. Chattock had, by his exertions, erected a monument for himself which few electrical engineers could equal. He designed and carried out the Summer Lane generating station; he designed the Nechells station, and the Committee hoped that he would design and carry out the super-station at Hams Hall. The toast was received with musical honours, and Mr. Chattock, in reply, expressed his appreciation of the loyalty and co-operation of the staff. He valued the cordial relations existing between the Committee, management, staff and workmen. He fully recognised that no one could enjoy life unless he enjoyed his work. There had never been any deficit in the undertaking, despite the advance in capital outlay, and he did not think there would be, as the position of the department was now stronger than it ever had been. During the evening musical interludes were provided by members of the staff.

Obituary.—MR. E. PRICE.—The death occurred on October 25th, at the age of 74 years, of Mr. Edward Price, who was the first engineer-manager of the Portsmouth municipal electric lighting undertaking, a position he held from 1891 until his retirement in 1903.

MR. H. F. FOSTER.—The death is announced of Mr. H. F. Foster, who was for a number of years electrical engineer to the Epsom Urban Council, and subsequently went into business for himself.

SIGNOR A. NETTI.—The death recently occurred in Rome at the age of 56 years of Signor Aldo Netti, a well-known electrical engineer who was associated with many of the large electricity undertakings in Italy.

New Companies Registered.

Oco Electrical Appliances, Ltd. (209,246).—Private company. Registered October 26th. Capital, £3,000 in 2,000 ordinary shares of £1 each and 20,000 deferred shares of 1s. each. Objects: To carry on the business of electricians, mechanical engineers and manufacturers, &c. The first directors are:—T. Halliday, 181, Rochdale Road, Oldham (director of T. Halliday, Ltd.); S. H. Johnson, 35, Brunswick Square, W.C., manufacturers' agent; W. H. Back, "Woodbury," 6, Maple Road, Leytonstone. Qualification, 1 ordinary share. Remuneration as fixed by the company. Solicitor: J. Wurzal, 68, Albion Street, Leeds. Registered office: Palace House, 128-132, Shaftesbury Avenue, W.1.

Robert J. Kidd & Co., Ltd. (209,255).—Private company. Registered October 26th. Capital, £1,000 in £1 shares (500 6 per cent. cumulative preference, free of income tax, and 500 ordinary). Objects: To acquire the business of X-ray specialists, and to give or assist in giving under medical supervision X-ray treatment in connection with maladies and diseases of all kinds, &c. The first directors are:—R. J. Kidd (permanent managing director), 5, Mabel Avenue, Great Lever, Bolton; W. A. Rowntree, 359, Green Lane, Bolton. Qualification, £200 shares. Remuneration, £12 each per annum.

British Resistor Co., Ltd. (209,287).—Private company. Registered October 28th. Capital, £1,000 in £1 shares. Objects: To act as representatives or agents for British or other firms in the electrical engineering and allied trades in connection with trade in the British and Colonial and other markets, to carry on business as mechanical, electrical, motor, agricultural, mining, metallurgical, chemical, railway and general engineers, merchants, factors, manufacturers, importers, and exporters of electrical and other machinery, &c. The permanent directors are:—A. Imbery, 14, St. Albans Avenue, Skircoat, Halifax, electrical engineer (managing director); D. Jones, 123, Parkinson Lane, Halifax, insurance inspector; A. Dobson, address not stated. Qualification, £100. Remuneration of directors (except managing director), £25 each per annum. Solicitors: A. Bastide, Elland and Briggate, Brighouse.

Foolprufe Patent Accumulator Co., Ltd. (209,216).—Private company. Registered October 24th. Capital, £1,000 in £1 shares. Objects: To carry on the business of designers, inventors, patentees, manufacturers and merchants of, agents for and dealers in accumulators, lamps, batteries, dynamos, magnetos, motors, power, heating and lighting plant and machinery, &c. The permanent directors are:—W. A. Millington, address not stated; E. A. Millington, Uplands, Lubenham Road, Market Harborough, coal merchant; G. F. Judd, Ashley, near Market Harborough, battery engineer. Secretary: J. Lees Smith, 32, The Square, Market Harborough. Solicitor: C. J. Crowther, 23, Abingdon Street, Westminster, S.W.

Cook-oo Manufacturing Co., Ltd. (209,286).—Private company. Registered October 28th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of loud speakers for wireless apparatus and all of such parts and accessories in connection therewith, manufacturers of and dealers in metals and minerals, electricians, engineers, &c. The directors are:—E. A. Ellis, 10, Deauville Court, Clapham Park, S.W., gentleman; Mrs. F. Cooke, 8, Russell Road, Moseley, Birmingham. Solicitors: A. T. Parker & Co., 105, Colmore Row, Birmingham. Registered office: Heath Works, Heathfield Road, Kings Heath, Birmingham.

Official Returns of Electrical Companies.

Euradic Electric Co., Ltd.—Particulars filed of £1,000 debentures authorised October 15th, 1925, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £300.

Belgravia Electrical Co., Ltd.—Debenture dated October 20th, 1925, to secure £550, charged on the company's undertaking and property, including uncalled capital. Holder: A. J. Marquand, 180, Albany Road, Roath, Cardiff.

Efandem Co., Ltd.—Satisfaction in full on October 10th, 1925, of debentures dated September 1st, 1914, securing £12,000.

National Signs, Ltd.—Satisfaction in full on September 14th, 1925, of debenture dated December 18th, 1924, and mortgage dated January 7th, 1925, securing £2,000.

Electro Pocket Cinemas, Ltd. — H. Chapman, of 171, High Street, Lowestoft, accountant, was appointed receiver on October 23rd, under powers contained in debenture dated February 24th, 1925.

Lancaster and District Tramways Co., Ltd.—T. Atkinson, of 2a, Euston Road, Morecambe, was appointed receiver on October 7th, 1925, under powers contained in mortgage debenture dated March 30th, 1900.

Imperial Tramways Co., Ltd. (58,981).—Return dated April 4th (filed August 28th), 1925. Capital, £400,000 in 20,000 preference and 20,000 ordinary shares of £10 each. All shares taken up. £100,000 paid on 10,000 preference. £300,000 considered as paid on the remainder. Mortgages and charges, £300,000.

Guy V. Laycock, Ltd. (173,770). — Return dated June 19th, 1925. Capital, £10,000 in £1 shares. 5,300 shares taken up. £1,300 paid. £4,000 considered as paid. Mortgages and charges, nil.

International Electric Co., Ltd. (113,906).—Return dated September 23rd, 1925. Capital, £51,000 in 31,000 ordinary and 20,000 preference shares of £1 each. 30,100 ordinary and 5,388 preference shares taken up. £32,488 paid on 27,100 ordinary and 5,388 preference shares. £3,000 considered as paid on 3,000 ordinary shares. Mortgages and charges, £70,500.

New Development Co., Ltd. (112,145). — Return dated July 14th, 1925. Capital, £5,000 in £1 shares. 1,275 shares taken up. £1,275 paid. Mortgages and charges, nil.

Young, Osmond & Young, Ltd.—Mortgage on 28, Broadway, Bexley Heath, Kent, dated October 20th, 1925, to secure £1,500. Holder: H. G. Weaver, 170, Coldharbour Road, Redland, Bristol.

Receptors, Ltd.—Issue on October 26th, 1925, of £700 debentures, part of a series already registered.

City Notes.

Reports and Meetings of Electrical Companies; Dividend Results, &c.

Montevideo Telephone Co., Ltd.

The annual meeting was held under the chairmanship of Viscount St. Davids on October 26th. In presenting the report and accounts (*vide* ELEC. REV., October 23rd, p. 669) the chairman said that the position of the company had gradually improved since the serious strike of 1922 and the subsequent legislation by the Uruguayan Government, which had reduced the dividend from 8 per cent., free of tax, to 5 per cent., less tax. During the past year the increase of business had necessitated a somewhat heavy capital expenditure; a number of new junction lines between the city and the "camp" had been built. Their investments had increased and the value of investments had appreciated. The gross revenue had increased by £11,000, and notwithstanding increased expenses in Montevideo, the decreases in other directions had raised the profit balance from £22,600 to £32,800. This enabled the directors to increase the dividend from 5 to 7 per cent. and to transfer a larger amount to reserve. The chairman concluded by paying a tribute to the work of the manager and his staff.

North Wales Power Co., Ltd.

Mr. K. M. Clark (chairman) presided at the annual meeting, on October 28th, and in the course of his speech said that there had been a satisfactory profit on the past year's working. After the deduction of debenture and loan interest and the addition of the sum brought forward, there remained an available balance of £20,205, out of which the full 8 per cent. was being paid on the preference shares, leaving £3,218 to be carried forward. The increase in the sales had been maintained; in 1924 the figure was 50 per cent. above that of the preceding year. Supplies were being afforded to most large towns on the coast, and it was expected that the supply to the Crewe works of the L.M.S. Railway would be commenced in a few weeks. Arrangements were also in hand and nearing completion by which supplies would be given to practically all the large centres of North Wales and South Cheshire which were at present without electricity. Most of the transmission lines had been completed and the remainder of the work was in progress. A double circuit h.p. transmission line had been erected between Crewe and the Mersey Power Co.'s works at Runcorn by which that station would

in the near future be linked up with the company's system. An important part of the scheme was the building of a new and important water-power station at Maentwrog, Merionethshire. The contractors were actively engaged upon the work and the foundations of the main dam had reached river level. Difficulties had been encountered owing to the rock formation. Three smaller dams were also being constructed. The route of the pipe line and conduit had been settled and work had begun on two tunnels. Every endeavour was being made to shorten the unproductive construction period, and when the work was finished it would benefit both the inhabitants of the district and the shareholders.

International Light and Power Co., Ltd.

The annual meeting was held on October 26th. Sir F. M. Voules, who presided, said that the company's ability to pay off so much of the preference dividend arrears was sufficient proof of its recovery after a period of depression. The foreign exchange position was steady and in the case of Brazil an improvement was shown. The recently-acquired undertaking of the South Brazilian Railways Company was now yielding net revenue at the rate of £20,000 per annum, which was £7,000 in excess of all fixed charges incurred in connection with the purchase. Certain improvements and extensions were being made. He was hopeful that the beneficial influence of the new President of the Mexican Republic would result in a return to prosperity of the Electric Light & Power Co. The unbroken record of growth and prosperity had been continued by the Caracas undertaking, and the electricity and tramway undertaking in Parana was steadily increasing its business.

Lisbon Electric Tramways, Ltd.

The annual meeting was held on October 28th, Mr. L. Breitmeyer presiding. In moving the adoption of the report and accounts (*vide* our last issue, p. 707) the chairman said that the affairs of the company showed continued improvement. The new arrangements under which the company was working were far more advantageous and would give the company an opportunity of doing justice to the long-suffering shareholders. Although the number of passengers carried had been lower, there was an increase in the receipts. After a long period it had been possible to pay off some of the arrears of preference dividend, and he (the chairman) trusted that the company would be able to continue on the same road. It was the intention of the company to pay the preference dividends as they fell due and to clear off the remainder of the arrears as soon as possible to enable the ordinary shareholders to receive some return on their holdings. Mr. Breitmeyer concluded his speech with a tribute to the services of the Lisbon local board and the general manager and his staff.

Aluminium Corporation, Ltd.

The report for the year ended December 31st, 1924, records a profit of £73,227, and after deducting debenture, &c., interest, and adding £6,323 from the last account, there is an available balance of £23,990, which it is proposed to carry forward, although the amount is sufficient to cover the payment of a preference dividend. The value of the company's lands, water rights and other assets, has been appreciated by £60,035 in the balance sheet and certain items in that account have been written off. The valuation is still below that placed upon the assets by surveyors engaged by the company. A joint of the new pipe line at Dalgarrog ruptured in November last, but the work of making good the damage, the reconstruction of the pipe line, and the completion of the low level dam and leet, together with the new power house, has been completed, and the new machines were put into commission at the end of September. Work has also been commenced on a tunnel connecting Eigiau and Cowlyd Lakes, which will greatly improve the Corporation's storage facilities. The meeting was to be held on Wednesday last.

Erinoid, Ltd.

Presiding at the annual meeting on October 27th, the chairman (Mr. A. Binnie) said that the balance sheet submitted was the best since the formation of the company in 1915. The profits had risen from £27,000 in 1924 to £49,000 last year due to increased sales. The progressive increase was due to the company's concentration on the production of the raw material, leaving other firms to work it into articles. The bulk of the sales were in England, but the company had a good market in Central Europe in spite of severe competition. The French market was supplied by the French company, aided by a high import duty. The French company was in a prosperous condition and enjoyed a high reputation in France. The dividend which was being paid was well within the company's means and the cash reserves were maintained. It was intended to clear off the whole of the debenture debt as soon as possible.

Prospectus.

Gretna and District Electricity Supply Co., Ltd.—This company, which is being formed for the purpose of supplying electricity for public and private use within the counties of Dumfries and Cumberland, has issued a prospectus. The company has a nominal capital of £15,000, divided into 15,000 shares of £1 each, the whole of which is offered for subscription. It is proposed that the company should enter into an agreement with the Government to purchase the existing electricity plant at Gretna for £6,204. The provisional committee includes Mr. J. S. Wise, electrical engineer, 86, The Rand, Eastrigg. Mr. James Hutcheon, solicitor, 58, Annan Road, Gretna, is secretary.

Stock Exchange Notices.—Dealings in the following have been specially allowed by the Committee under Rule 159:—

Pettigrew & Merriman (1925).—125,000 7½ per cent. cumulative preference shares of £1 each, 10s. paid, Nos. 1 to 125,000.

Electrical Distribution of Yorkshire.—250,000 new ordinary shares of £1 each, issued at £1 6s. per share, partly paid and fully paid, Nos. 250,001 to 500,000.

Application has been made to the Committee to allow the following to be officially quoted:—

Madras Electric Supply Corporation.—250,000 5½ per cent. preference shares (free of income tax) of £1 each, fully paid, Nos. 53,201 to 303,200 (cumulative).

Singapore Traction Co.—93,739 ordinary shares of £1 each, fully paid, Nos. 1 to 93,739; and 152,890 7 per cent. cumulative preference shares of £1 each, fully paid, Nos. 1 to 152,890.

Southern Brazil Electric Co., Ltd.—A loss of £20,861 was incurred during the past year, representing mainly debenture interest charged in the accounts but paid after the close of the year. The interest payments are now only six months in arrear, and the debt due to the Inland Revenue has been reduced by £10,000. The earnings of the company's subsidiaries showed a satisfactory increase, but certain capital expenditure has to be incurred in conformity with the terms of concessions. During the current year the progress has been maintained. The meeting was to be held on Wednesday last.

Mann, Egerton & Co., Ltd.—A meeting was to be held on Tuesday last for the purpose of considering proposals to reduce the company's capital from £400,000 to £370,925 by cancelling 9s. per share; and to pay off arrears on the 8 per cent. preference shares from January 1st, 1922, to September 30th, 1924, by the issue of 6 per cent. funding certificates, the dividend on the preference shares to be cumulative only as to 6 per cent.

Alabama Traction, Light and Power Co., Ltd.—The proposal to exchange the company's 5 per cent. first mortgage 50-year gold bonds for 6 per cent. gold debentures, series "A," due 2025, of the South-Eastern Power & Light Co., with rights to subscribe for that company's common stock, was approved at a meeting held in Montreal on October 7th.

Missouri Power & Light Co.—The whole of the company's first mortgage and refunding general lien sinking fund series "A" 7 per cent. and series "B" 6½ per cent. bonds, due 1943, are to be redeemed on December 1st at 105 and accrued interest.

Ever-Ready (Great Britain), Ltd.—Interim dividends at the rate of 10 per cent. on the old preference and ordinary shares, and of 4d. per share on the new preference shares have been declared.

Swedish Company.—The report of the *Allmanna Telefon Aktiebolag L. M. Ericsson*, of Stockholm, for the last financial year shows a net profit of 2,040,000 kr., as compared with 2,060,000 kr. in the preceding twelve months. A dividend of 2½ per cent. is being declared. The report states that owing to increasing import duties it has been found necessary to establish affiliated companies in different countries. There are now Ericsson telephone works in England, Austria, Hungary, Holland, France, Poland, Mexico, Finland, Argentina, Spain, and Italy.

French Companies.—*La Compagnie Française des Câbles Télégraphiques*, of Paris, reports a net profit of 6,037,929 fr. for the last financial year as compared with 5,446,379 fr. in the preceding twelve months.

The report of the *Société Electro-Métallurgique de Dives* for the year ended June 30th last shows a net profit of 9,055,252 fr., as compared with only 5,535,631 fr. in the preceding year.

Belgian Company.—The *Société de Câbles et Corderies du Hainaut*, of Eupen, reports a net profit of 1,059,853 fr. for the last financial year. The directors state that during the year considerable extensions were made to the cable section of the works.

Italian Companies.—*La Società Ligure-Toscana d'Elettricità* is increasing its capital from 125 to 175 million lire. The *Società Elettrica del Valdarno*, which is acquiring an interest in the gas undertaking in Rome, also proposes to increase its capital from 80 to 150 million lire.

Fuller's United Electric Works, Ltd.—A meeting of the holders of income debenture stock was to be held yesterday to approve of the appointment of Sir W. H. Peat as a trustee in place of Brig.-Gen. H. A. Jones, the retiring trustee.

Aron Electricity Meter, Ltd.—An interim dividend of 3 per cent. actual has been declared on the 6 per cent. preference shares.

City of Buenos Aires Tramways (1904), Ltd.—A dividend at the rate of 5 per cent. has been declared in respect of the September quarter.

Isle of Wight Electric Light and Power Co., Ltd.—An interim dividend of 4 per cent., free of tax, has been declared on the ordinary shares as in 1924.

Calcutta Tramways Co., Ltd.—An interim dividend of 4 per cent., free of tax, has been declared on the ordinary shares, as last year.

Stocks and Shares.

MONDAY EVENING.

ALTHOUGH to-day, Monday, is by century of tradition, a Stock Exchange holiday, many Stock Exchange offices have been fully staffed by partners and clerks glad (in their due proportions) to have the opportunity, afforded by a few quiet hours, for dealing with the work caused by busy markets and strenuous times. The tides of Stock Exchange activity roll rather capriciously. Some men have more business than they can comfortably handle: others could redouble their energies and still escape overwork. Each market in turn receives, however, its due meed of attention. Brokers, dealing in all the markets, are mostly busy all the time.

General recovery in steam railway stocks followed the intimation that the railwaymen do not intend to be swung at the tail of a tribe of turbulent agitators whose avowed object is to create trouble. The Undergrounds, however, are inclined to be lower: Districts and Metropolitans have both gone back. Lord Ashfield has been indicating the extraordinary way in which the Undergrounds have spread, physically and financially, within the last 25 years. The amount of capital employed, he said, in 1900 was fifteen million pounds in underground railways, in omnibuses and in trams: to-day, it reaches eight times that sum. Mileage on the Underground Railway has more than doubled, rising from 35 to 78. Lord Ashfield suggested that the extensions now in hand might prove to be the end of the present programme.

The same speaker, presiding at the recent meeting of shareholders in the United of Havana Railways, mentioned that the company owns a steam railway and an electric railway, while it also supplies electricity for power and lighting. An American group of capitalists has been trying, according to correctly-informed rumour, to acquire at any rate part of the United of Havana Railways' undertaking. The market price of the stock has been steadily rising for some time past by reason of purchases said to be made on this account. Calcutta Tramways shares are unchanged at 25s. 6d.; the interim dividend of 4 per cent. tax-free, is the same as that of a year ago.

British Columbia Electric Railway stocks are strong, the deferred being 4 higher at 118½, the preferred, at 78¼, having gained a point. Brazilian Tractions reacted to 80; the 6 per cent. preference keep hard at 100. Anglo-Argentine first preference regained their small loss of last week, and Mexican issues have been uninteresting.

Edison Swan 5 per cent. first debenture is 3½ higher at 84, by way of reflection of the recent jump in the price of the ordinary shares. The company's 5½ per cent. second debenture stands at 78½ and the 7½ per cent. first preference shares at 22s. The ordinary retain their big rise at 9s. 3d. Manufacturing shares are again very firm, and shares are difficult to buy. Brush have stiffened to 24s. 6d. English Electric ordinary and preference are 6d. better in each case. Cables are good, too, Henleys at 3 7/16 being ¼ up, and Callenders equally better at 3¾. India-Rubbers are a florin higher at 1½. On the other hand, Johnson & Phillips lost 1s. after their previous big advance.

Globe Telegraph ordinary have improved to 18, Western Telegraphs to 17, and Eastern Extensions to 17¾. Indo-Europeans are down a sovereign, to 43¼. The telephone shares hold their strength. United River Plates at 7 7/16 have gained 1/16 and the new shares are close to 46s. premium. Those who have the right to apply for the latter should see to it that they do not let slip the fine bonus offered to proprietors by the new issue.

Marconis drooped to 27s. 6d., Canadian Marconis to 6s. 10½d. The Radio Corporation of America reports, for the second consecutive quarter, a deficit that is thought to be due to rate cutting, and a smaller demand for radio sets. Burndept shares, still in request from America, have continued to harden, the shilling deferred shares being 5s. 6d. United States capital is now turning towards some of the British motor companies in its search for profitable employment. Possibly the Americans do not feel flattered at the reception accorded to their overtures for introducing United States capital into well-known electricity supply companies that operate on this side.

The list of prices in the London group is very quiet. London Electric preference strengthened to 5¾. Elsewhere, sixpenny gains have been secured by Newcastle-on-Tyne ordinary and North Metropolitan preference. Lancashires remain at 25s. 6d.; the new issue of shares will be made, it is expected, almost at once. The iron and steel market is fairly good. Babcock & Wilcox have risen to 53s. Interest in rubber shares remains at a high level, though not so high as that of a month ago. Prices are good in all sections of the market. A hint may be dropped as to the advisability of using keen discrimination when applying for shares in new rubber companies.

Share List of Electrical Companies.

	Nom. £	Dividend. 1923.	Dividend. 1924.	Price Nov. 2. 1925.	Rise or fall.	Yield p.c.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	13	14	21½	—	4 15 4
Brompton Ordinary	1	10	10	12	—	*5 14 3
Charing Cross Ordinary	1	14½	15	30/-	—	6 2 6
do. do. 4½ Pref....	1	4½	4½	17/6	—	5 2 10
Chelsea	1	12	12	13	—	6 8 0
City of London	1	15	15	47/-	—	6 7 4
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	27/6	—	5 16 4
County of London	1	15	15	57/-	—	5 5 2
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Edmundson's Ordinary	1	7	7	22/-	—	6 7 3
do. 7% Pref.	1	6	7	21/6	—	6 10 3
Elec. Supply Corporation ...	1	10	10	31/3	—	6 8 0
Kensington Ordinary	5	14	15	12½	—	5 16 8
Lancs. Light and Power	1	7½	7½	25/6	—	5 17 8
London Electric	1	10	10	34/-	—	5 17 8
do. do. 6% Pref.... ...	5	6	6	5[5]	+ ⅛	5 6 6
Metropolitan	1	10	11	38/4	—	5 14 4
do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	5½	6	22/3	—	5 7 10
Newcastle-on-Tyne Ordinary ...	1	6	7	22/6	+6d.	6 4 5
do. 5% Pref. ...	1	5	5	18/9	—	5 6 8
do. 7% Pref. ...	1	7	7	24/-	—	5 16 8
Notting Hill 6% Pref.	10	6	6	9½	—	6 6 4
North Met. Elec. 6% Pref. ...	1	6	6	22/6	+6d.	5 6 8
St. James' and Pall Mall	5	17½	17½	14[7]	—	5 17 8
South London	1	15	15	2[15]	—	5 17 1
South Metropolitan Pref. ...	1	7	7	1½	—	5 13 0
Urban Ordinary	1	4	4	18/3	—	4 7 8
do. 6% Pref. ...	1	6	6	18/9xd	—	6 8 1
Westminster Ordinary	1	15	15	44/6	—	6 14 10
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	1	—	7 10 0
Yorkshire Elec.	1	8	8	29/6	—	5 8 6
HOME RAILS.						
Central London Ord. Assented	Stock	4	4	67	—	5 19 5
Metropolitan	,,	4	5	70	—1	7 2 10
do. District	,,	3½	3½	46	—1	7 12 1
Underground Electric Ordinary	10	Nil	Nil	2½	— ⅛	Nil
do. do. "A" ...	1/-	Nil	Nil	7/-	—	Nil
do. do. Income	Bonds	6	6	97	—	*6 3 9
TELEGRAPHS AND TELEPHONES.						
Anglo-Am. Tel. Pref.	Stock	6	6	102	—	5 17 8
do. Def.	,,	1½	1½	24½	—	6 3 9
Automatic Telephone	1	3	6	47/6	—	3 10 7
Chili Telephone	5	5	5	6[5]	—	*4 7 0
Cuba Sub. Ord.	10	5	5	6[3]	—	7 8 9
Eastern Extension	10	10	10	17[3]	+ ½	*5 12 8
Eastern Tel. Ord.	Stock	10	10	174½	—	*5 14 7
Globe Tel. and T. Ord.	10	10	10	18	+ ½	*5 11 1
do. do. Pref.	10	6	6	11	—	5 8 1
Great Northern Tel.	10	22	22	35	—	6 5 9
Indo-European	25	7	8½	43¼	—1	*4 17 8
Marconi	1	10	10	1[3]	— [1]/[6]	7 6 6
Marconi Marine	1	10	7½	3	—	8 11 6
Oriental Telephone Ord. ...	1	12	12	2½	—	*5 13 4
United R. Plate Tel.	5	8	8	7[7]	+ [1]/[16]	5 7 6
Western Telegraph	10	10	10	17	+ ½	*5 17 8
HOME AND FOREIGN TRAMS, &c.						
Anglo-Arg. Trams First Pref. ...	5	5½	5½	3[3]	+ [1]/[16]	8 3 6
do. do. 2nd Pref. ...	5	6	6	3[3]	—	8 17 10
do. do. 5% Deb. ...	Stock	5	5	78½	+1	6 7 5
British Electric Traction Ord. ...	,,	6	6	123½	+1	4 17 2
do. do. 6% Pref. ...	,,	6	6	107	—	5 12 2
Brazil Traction	100	4	4	80	—1	5 0 0
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	89½	—	5 11 9
do. do. Preferred	,,	90/-	90/-	96½	+3	*4 19 6
do. do. Deferred	,,	129/5	129/5	118½	+4	*5 9 0
do. do. Deb.	,,	4½	4½	77½	—	5 9 8
Lond. & Sub. Trac. 5% Pref. ...	1	2½	Nil	4/6	—	Nil
London United Tram. Deb. ...	Stock	4	4	43½	—	9 8
Mexico Trams, 5% Bonds ...	—	5	5	63½	—	7 17 6
Mexican Light Common ...	100	Nil	Nil	33	—	Nil
do. Pref.	100	Nil	Nil	63½	—	Nil
do. 1st Bonds ...	—	5	5	70½	+1	7 1 11
Yorkshire (West Riding) ...	1	5	—	18/9	—	5 6 8
MANUFACTURING COMPANIES.						
Babcock & Wilcox	1	12	12	53/-	+6d.	*4 16 5
British Aluminium Ord.	1	5	10	1[3]	—	5 6 8
British Elec. Transformer Pref.	1	Nil	7	1	—	... ...
British Insulated Ord.	1	15	15	3[3]	—	4 0 0
Brush Ord.	1	10	10	24/6	+9d.	8 3 5
Callenders	1	15	15	3[3]	+2/6	4 9 0
do. 8½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	[1]/[3]	—	... ...
Edison-Swan	4/-	10	10	9/3	—	5 6 8
do. 5% Deb.	Stock	5	5	64	+2[5]	5 19 1
Electric Construction	1	10	10	1[1]/[2]	+[1]/[2]	5 18 6
Enfield Cable, Pref.	1	7½	7½	1[3]	—	6 0 0
English Electric	1	5	5	18/9	+6d.	5 6 8
do. do. Pref.	1	6	6	20/6	+ 6d.	5 17 1
Gen. Elec. Pref.	1	6½	6½	23/9	—	5 9 5
do. Ord.	1	5	7½	2[9]/-	—	5 3 5
Henley	1	15	16	3[7]/[8]	+ ⅛	4 10 5
do. 4½% Pref.	5	4½	4½	4[3]	—	5 6 0
India-Rubber	1	5	5	1[3]	+2/-	*4 9 0
Johnson & Phillips	1	10	10	5[7]/9	—1/-	3 14 4
Met-Vickers, Ord.	1	8	8	21[1]/[4]	+6d.	6 10 8
do. Pref.	2	8	8	2[3]	—	6 14 9
Siemens Ord.	1	—	7½	32/-	—	4 18 9
Telegraph Construction	12	20	20	26½	—	4 10 0

* Dividends paid free of Income Tax.

The Institution of Electrical Engineers.

Inaugural Address by R. A. CHATTOCK, President I.E.E. *(Abstract).*

(Concluded from page 693.)

From articles that have appeared in the Press it is fairly clear that the Report of the Committee set up by the Government will propose to change over to 50 periods those districts in the country that are being supplied with alternating current of periodicities other than 50. It appears that the proposal is designed: (1) to make it possible to exchange current between districts by means of large-capacity trunk lines linking them together; (2) to reduce the range of apparatus that now has to be manufactured and stocked, and so cheapen the purchase price of all electrical apparatus; and (3) to do away with the necessity of converting alternating current to direct current for general distribution.

Considering (1) first, trunk lines for this purpose would require to have a capacity of at least 20,000 kW, and run at a voltage not less than 110,000 between phases. The length of the lines required to connect up all large centres of supply would be roughly 1,900 miles, and the cost would amount to approximately £5,700,000.

It is obvious that the bulk of the supply in each district must be derived from stations on the spot, as the loss in transmission over 50 or 100 miles would cancel out any problematical saving that might be effected through better natural facilities. Such stations having high economy of operation are coming into existence, and it is becoming apparent that each district can economically serve itself and provide its own stand-by plant without any necessity for drawing supplies from other districts at such an enormous capital cost.

By all means link up the individual stations in each district, at a fraction of the cost of linking-up nationally, and take advantage of the high economy of operation of the best station in each district at times of light load.

It has been stated that such trunk lines will open up the rural districts throughout the country. It is, I think, obvious that such large-capacity lines cannot be safely tapped except at well-defined centres, and that the opening-up of rural districts must depend upon a network of thin overhead lines radiating from the large centres of supply. The rural demand can never justify a heavy expenditure on distribution, and the greatest care and economy will have to be used in designing such distributing systems.

Turning now to (2), there should be an average saving of 15 per cent. in the cost of 50-period electrical apparatus, such as generators, motors, and transformers, over 25-period apparatus. This is to some extent counteracted by the higher speed at which 50-period motors run, necessitating speed-reduction gear. 50-period induction motors also create a lower power factor on the system, the difference being about 5 per cent., and this curtails the carrying capacity of the distributing mains and necessitates the installation of larger transformers. There does not therefore appear to be much real advantage in this claim.

As regards (3), it is admitted that there is a very slight flicker noticeable on the lights when supplied with low-tension 25-period current. This can, however, be largely eliminated by suitable shading in living rooms, and it is only in these that there can be any reasonable objection raised. In factories and business premises, and even in drawing offices, it is being very largely used without any inconvenience.

In most large towns direct-current distribution is already in existence, and the recent development of the mercury-arc rectifier, whilst being admittedly rather more expensive than a.c. transformer distribution, has solved the problem of the high cost of rotary-converter sub-stations and the necessity of employing labour to run them for supplying outlying residential districts.

It must be admitted that direct current is safer than alternating current for domestic apparatus, and now that this apparatus is coming into such general use this point should receive careful consideration.

If railway electrification becomes general in this country—and there is strong evidence that this is coming in the near future—it seems certain that direct current at a pressure of 1,500 volts will become standard. This is being largely adopted on the Continent, and military considerations will probably weigh heavily in the matter. If so, rotary converters or mercury-arc rectifiers will probably be used, and for these 25-period current is far preferable to 50-period. We must not forget that we want the railway load to improve the load factor and reduce the cost of supply.

Let us now consider the probable cost of such a change. It would be necessary to replace the whole of the a.c. apparatus with new 50-period plant, not only that belonging to the supply undertakings, but also that installed on consumers' premises. It is estimated that about 25 per cent. of the electrical plant installed in the country is other than 50-period plant.

I have made a close estimate of the capacity of the a.c. plant that would have to be replaced in the Birmingham area. This amounts to 486,870 kW belonging to the undertaking, and 337,350 kW belonging to its consumers. Total, 824,220 kW.

The cost of this at £3 10s. per kW would be £2,880,000.

Allowing scrap value for the old plant of 6¼ per cent., because there would be no market for it, it would realise £180,000.

The net cost of replacement would therefore be £2,700,000.

There would be other costs, such as the provision of duplicate mains and switchgear to make the change-over possible, the salaries of a considerable staff, compensation for interference with consumers' business, &c., which I have estimated at £4,000,000.

The total estimated cost for Birmingham would therefore be £6,700,000.

Applying this estimate to the rest of the areas in the country using periodicities other than 50, we get a figure for the country of approximately £27,000,000.

Can such a colossal expenditure be justified, for the reasons I have indicated above—reasons which, as I have shown, will not really bear investigation?

If the Government wants to develop the electrical industry and to cheapen the cost of supply, it would be far more profitable to spend the money on improving the load factors throughout the country. This could be done by electrifying the railways and equipping the coal mines with complete electrical plant for getting the coal and pumping and ventilating the mines. Expenditure of this kind would prove to be remunerative, and could be regarded as a compulsory loan to cheapen and foster what are, after all, public utility services.

The United States of America is frequently held up as an example to be followed. They run two frequencies in America—25 periods and 60 periods—and they are not contemplating changing over one of these to the other. Let us therefore take a leaf out of their book and leave well alone.

A development that has recently been introduced in Birmingham has had the effect of relieving the ordinary direct-current three-wire network and its system of feeders. I refer to the arrangement that is now made to couple small power consumers to the extra-high-tension three-phase system. Hitherto this system, which is supplied at a pressure of 5,000 volts between phases, has been confined to consumers who have at least 100 h.p. installed, as each service entailed the use of three oil-switch panels for controlling the incoming and outgoing cables and the supply to the consumer. A special type of service connection has now been developed at a very much reduced cost, which makes it possible to supply power consumers whose demand is only 30 h.p. and upwards, the only difference between this and the larger consumer's service being that the connection is teed off the main instead of being looped in and out, so that there is no alternative source of supply. This is, however, only comparable with the ordinary power consumer off the d.c. network. It is found that this arrangement is likely to have a very beneficial effect upon the cost of distribution generally.

I am frequently asked by parents what kind of training I should recommend to fit boys for the engineering profession. As a broad principle, I think that a boy should enter a technical college when he leaves school. He should spend not less than three years at college, and should endeavour to obtain some engineering degree. The necessity for demonstrating that he has a good general education as well as a thorough technical education is very important, as he will find that after he has passed through the junior stages of his career, which of course chiefly require technical knowledge, he will have to undertake duties of a managerial nature, which require a more general knowledge and the power to conduct correspondence with lucidity. This can only come easily to a man who has had a good general education, who is conversant with literature, and who is able to convey his ideas with conciseness.

After finishing his technical course at college, he should spend at least two years in some large engineering works.

When his training is completed, the boy should be about 21 years of age, and should be capable of taking a position as junior engineer in any electric supply undertaking. His advancement from this position to higher positions must depend largely upon his own ability.

It is interesting to note that the Electrical Power Engineers' Association is arranging for those of its members who have passed a certain standard to be allowed to call themselves "qualified electrical engineers." Before they become so qualified, they must have had a certain number of years' experience in supply undertakings of a certain size, and they must have passed the Examination required for Associate Membership of this Institution or some examination equivalent to it. I think that this is a very valuable step in the right direction, in that it will tend to ensure that engineers of supply undertakings can demonstrate that they have been properly trained.

In my own undertaking it has been the rule for some years that engineers who have not passed the A.M.I.E.E. examination or its equivalent cannot rise higher in the technical staff than a certain grade, and those men who do not so fit themselves will find in a few years that younger men will be passing over their heads. In the case of old servants, a certain amount of latitude should be allowed as long as there is proper willingness and endeavour on the part of the individual to fall in with this very necessary requirement.

I should like to take this opportunity of urging those controlling not only electricity supply undertakings but also manu-

facturing concerns, to consider very carefully whether it would not be to the ultimate benefit, both of their own undertakings and of the industry as a whole, to make it compulsory that men on the technical staff should pass a certain standard. The necessity for this is clearly demonstrated by the fact that when one advertises for a technical assistant, out of the 150 to 200 applications that are received, only about 20 per cent. are of any real use. The rest, whilst they have had some experience, are generally either limited in such a way that they can be trusted to handle only one particular section of the work, or they are obviously unfitted for even as much as that.

If all employers had required a certain standard, men of this kind would never have got as far as they have, and the material available to be drawn upon, while being less in quantity, would be greatly improved in quality.

In conclusion, there appear to be two main points to which supply engineers should give special attention. I refer to improving the load factors of our undertakings, which have to all intents and purposes stood still for so long; and to decreasing the cost of distribution, which has recently tended to increase and to counteract the economies that are being practised in other directions.

A Survey of the Fields of Electrical Progress.

By J. P. THOMPSON.

(*Abstract of the Chairman's Address;* DUNDEE SUB-CENTRE *of the* INSTITUTION OF ELECTRICAL ENGINEERS.)

THE duties of those engaged in electrical work are varied and complex. It is therefore natural that men should find themselves gradually specialising in one branch or department and, in fact, it would be quite impossible for the average individual, at any rate, to be an expert in every department of electrical development. Electricity is rendering, in a multitude of ways, great service to man. This service will go on increasing, and as electrical engineers we should endeavour to develop the spirit of service. We cannot cultivate the idea of service to any great extent without becoming enthusiastic in our work, and all electrical engineers should be enthusiasts. Enthusiasm run wild may, however, be dangerous. The man who insists that electricity should be used for every cooking, transport or hot water supply problem, without thoroughly going into the details of the case, may easily do harm. There are questions to be considered, such as the capital cost of the apparatus and the cost of altering existing arrangements, &c., and these may, for the time being, render a scheme impracticable.

The public cannot, I think, know too much about electricity, and in this connection the Electrical Development Association is carrying on very excellent educational work in bringing to the public notice the uses and advantages of electricity supply. The country, as a whole, is passing through a period of serious trade depression and it is encouraging to note that, while such is the case, the output of the electricity stations for the year ended March 31st, 1925, showed an increase of some 734 million kWh compared with the previous year. This is an increase of 11 per cent., but the fuel used increased by only 5.8 per cent., showing that the thermal efficiency is improving.

The problem for the country is to obtain reliable supplies of power at as low a cost as possible. For works making a large demand for both power and steam, where a case can really be made out for generation on the spot in place of purchasing power, I think the provision by the supply undertaking of suitable plant on or close to the consumer's works, coupled with a connection to the main cable system, would reduce the total amount of generating plant required and at the same time afford the most reliable supply at the minimum cost.

The demand for power purposes will, of course, not remain stationary, and certainly no one wishes that it should, but I want to bring out the tremendous possibilities being opened up by the domestic load. There seems no reason why the sale of energy to this class of consumer should not increase much more than ten-fold. While, according to the return of the Electricity Commissioners for 1920 to 1923, the sales for lighting and domestic uses and for power purposes represented respectively 19 per cent. and 68 per cent. of the total, the revenue was in each case approximately 42 per cent. of the total. A ten-fold increase in sales for domestic purposes would probably increase the revenue approximately three-fold. This perhaps is the reason why some engineers seem to fight rather shy of pushing the domestic load, apparently fearing that the whole of their cable system will quickly become loaded up and that in no time they will find themselves in all sorts of difficulties. But why not load up cables? Which is the better, a factory making a demand on the station of 100 kW, or a considerable number of houses providing a combined load on the station of the same amount? Such a factory working 44 hours per week might possibly take 220,000 kWh per annum, and this would be possible only on a load factor of 100 per cent. Take, now, 100 houses, each using 200 kWh for lighting and assume an increase in consumption of 180,000 kWh for domestic uses. The maximum load on the station for this output of 180,000 kWh for domestic purposes would, however, due to the better load factor of that class of load, be less than 100 kW and probably not more than 68 kW. While the load factor of the individual domestic installation is low, the diversity factor comes to the rescue to such an extent that the load factor on the station in respect of supplies for domestic purposes other than lighting is considerably higher than that from supplies to factories and other concerns working the ordinary day hours only.

So far, then, as the cost of generation, transmission to substations and transformation is concerned, current for domestic supplies can be delivered at the low-pressure terminals of the sub-station transformers more cheaply than for factory supplies. The only additional cost, therefore, of supplying energy for domestic purposes from the low-pressure distribution mains compared with supplying energy to a factory from a sub-station in the factory, is that in respect of the outlay in providing additional copper in the distribution mains. The interest and other charges on such additional outlay is certainly more than provided for by the revenue received from the sale of 50 per cent. more current than would be taken by the factory for the same loading on the station plant, transmission cables and transformers. It would appear, therefore, sound practice not to cut down too much the copper in new low-pressure distribution mains, especially as such additional copper is generally obtained at comparatively little extra cost. The problem may be considerably simplified by having transforming sub-stations placed at frequent intervals. This allows a fuller use to be made of the copper in the low-pressure mains without undue voltage drop. For purely residential districts and thinly populated areas it would seem desirable to adopt a higher pressure, say, 3,000 volts, for the distribution mains, using transformers for each house or for groups of houses as required, and in this way ultimately limiting the low-pressure distribution cables fed from each transformer to, say, not more than a few hundred yards in length. It would seem unnecessary to provide any switch or fuse gear on the 3,000-volt side of these transformers, and the transformers would simply form part of the cable system. The space taken up by a transformer of, say, 100 kW, arranged in this way is very small and should easily be arranged for.

Supply engineers are apt sometimes to look upon installation work as a job that any fool can tackle. That is not my own view, and I think there is a large scope in the contracting business for good engineers. Unless premises are wired, the supply undertakings cannot sell energy, and it is the business of contractors to wire premises. Supply undertakings should, therefore, welcome every application brought in by contractors and should give contractors, especially the smaller firms just starting business, all the assistance possible. On the other hand, contractors should see to it that only sound jobs are carried out, as otherwise they will bring discredit, not only on themselves, but on the whole industry, and retard the rate of development. There is no doubt that but for the high cost of wiring, new consumers of electricity would be secured at a very rapid rate. To reduce the cost of wiring by using inferior material and rough workmanship will not help matters. Is there no other way of reducing installation costs? Any method of providing satisfactory installations at less cost would undoubtedly secure increased business for contractors and supply undertakings both. There would still remain, however, the difficulty of the tenant occupier, and some system of assisted hire purchase or free wiring, call it what you will, seems necessary in order to deal with a very large proportion of the at present unwired premises. Even now the supply undertaking takes the risk of putting down power stations, transmission cables, sub-stations, distribution mains, service lines, and meters. Why not carry on a stage further and wire up to the actual lamp or other current-consuming device, and by so doing secure more consumers per unit length of distribution main?

As one kWh has a fixed heat value, all electric fires have, in one sense, an equal efficiency of 100 per cent. What may, however, be called the effective efficiency, varies very considerably, and it is always necessary when advising on the use of electric heating, to try and figure out what exactly is the duty required of the heater, otherwise the best results cannot be expected. In this connection it is well to remember that the best condition for working is to have warm feet and a cool head. For example, a small amount of heat applied under a desk or table from, say, a 250-watt fire, will frequently give better results than a 2,000-watt fire placed in the wrong corner of the room. The heating of water offers some very interesting problems, and while it may be difficult to see how electricity can compete in cost with coal or coke for heating large quantities of water, there are many cases where the matter is not nearly so hopeless as may appear at first sight. The very high efficiency of the apparatus, the ease with which the water may be heated at points of use and the absence of all labour, fumes, dust, &c., are frequently sufficient to turn the scale

entirely in favour of electricity. Water heating also opens up possibilities of securing a considerable load at a steady rate over the 24 hours of each day. The battery vehicle does not seem to make the progress in this country one would have expected. We all know the dislike many engineers have for storage batteries, a dislike brought about, in many cases, I believe, by installing a battery for a certain purpose and using it for duties for which it was never intended. We should, however, be just, and in such cases it is hardly fair to blame the battery.

The trolley 'bus is being tried in a number of districts and one would like to see this type of vehicle proving successful; in certain districts, given definite routes of suitable mileage, one would imagine that the battery vehicles even might also find a place. With batteries suitably arranged for quick exchange at a depôt, these vehicles would appear to possess certain advantages over petrol vehicles, in addition to providing a profitable load for the supply undertaking. And why not use some of the country's coal for this purpose instead of importing petrol? The surface of our roadways generally is being steadily improved, and I really think we should give more attention to the use of battery vehicles in transport problems than we have perhaps done in the past, and I hope we shall soon become more familiar with the appearance of such vehicles on our streets.

I am glad to notice that the supply of electricity to farms is receiving increasing attention. Where 6,600-volt or 11,000-volt lines or cables exist there is no difficulty in giving a supply from them. In my own area a supply is at present given to some 50 farms and I know how greatly the advantages are appreciated by the farmers. There is no doubt about the advantages arising from a supply of power "on tap" at the farm, and it is, I think, up to us to see that electricity is brought within reach of as many farms as possible, and in the interests of the country we cannot do this too soon. For purely farming and rural areas, I think, it is likely that some cheap form of distribution, for the most part overhead, at a pressure of about 3,000 volts, will be found the most suitable all round.

We still hear a good deal about "cheap and abundant supplies of electricity"—a rather unfortunate phrase, I think, and one that is apt to do more harm than good. The price of electricity in this country is not high and is certainly not responsible for trade depression. It is questionable if many industries finding it difficult, in these days, to make ends meet, would be appreciably better off if supplied with electricity free. The price of electricity for various uses should very largely be regulated by the cost of the alternative methods of obtaining the power, light, or heat required.

The Buenos Aires Transport System.

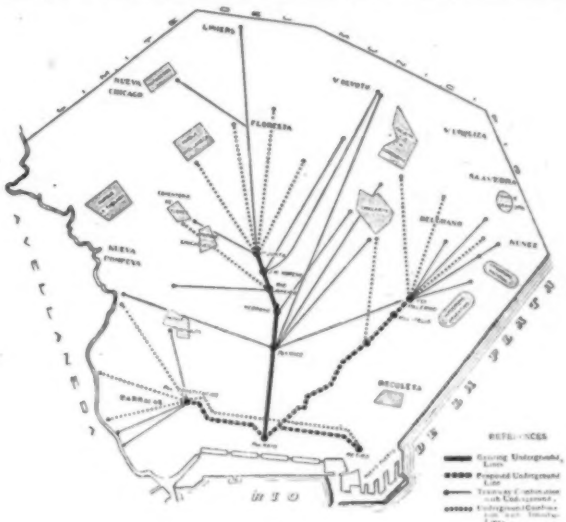
The Anglo-Argentine Tramways Company's Plan.

THE accompanying map, for which, together with the descriptive notes, we are indebted to the *Review of the River Plate*, makes clear the traffic arrangements in Buenos Aires so far as the Anglo-Argentine Tramways Co., Ltd., is concerned. The notes are based on a report by the general manager of the company (M. Marcel Rongé) to the municipal authority.

In Buenos Aires the communication between the centre of the city and the outer areas is becoming daily more difficult and slower. This is due to the fact that the centre of activity (quite a small area) does not coincide with the geographical centre; the narrowness of the streets in the centre of activity; and the absence of an efficient traffic-regulating scheme. Although the tramways contribute to the congestion it is considered that upon the whole they have helped to make the trouble less acute owing to their large carrying capacity in relation to their bulk. The company realises, however, that the best means of dealing with the problem is by means of subways which combine the advantages of capacity, velocity and commodity. The surveys effected by the company have led to the conclusion that the construction of an underground line in a north-south direction between Retiro and Constitucion, linking up the centre of the city with the great terminal stations of the Central Argentine, Cordoba Central, Pacific, and Great Southern Railways and these stations with each other, would play a part of the first importance in the sum total of the measures designed to alleviate the traffic intensity of the central streets. This underground line, which would cross the zone of the greatest activity beneath the streets of Chacabuco-Maipú, combining with the line to Plaza Italia at a trans-shipping station at the junction in the Avenida Presidente Roque Saenz Peña, and would likewise be in communication by means of a tunnel with the Perú station of the existing subway, would tend to facilitate the circulation in those streets within the central zone which run from north to south, and would afford to the public constantly arriving by the railways mentioned a rapid and comfortable means of transport to their places of daily occupation.

The company has also recognised the convenience to the public of the construction of a third underground line connecting the centre of the city with the densely populated zones in the north-west—Belgrano and neighbourhood. The connection of the three lines has been planned in such a manner that passengers who so desire can pass from one line to another at any of the trans-shipping stations without having to go above ground. The Anglo-Argentine Tramways Co. proposes as a result of the alleviation of the intensity of the surface traffic to reduce the circulation upon certain lines and to totally abandon others in the streets with the densest traffic. On one route, to avoid inconvenience to the public, an omnibus service will take the place of the tramway. To effect distribution of passengers from the subway termini a number of omnibus services will be organised as shown on the map.

In the opinion of the company, this plan, which takes account of the requirements for some years ahead, and would



The Buenos Aires Transport System—Existing and Projected.

add to the already vast transport system of the city 22 km. of underground lines and 180 km. of omnibus routes at a capital cost of $130,000,000 m/n, is at once methodical and progressive and permits of all the extensions which the future growth of this great capital may render desirable or necessary.

An expert committee appointed by the Buenos Aires Municipal Council to study the scheme has advised the Council to adopt it. This committee also proposed a new tariff of fares on the various parts of the Anglo-Argentine Tramway Company's system.

Conditions in Austria.

Power and Railway Developments.

THE Commercial Secretary of the British Legation at Vienna (Mr. O. S. Phillpotts) has forwarded a report upon commercial and financial conditions in Austria* to the Department of Overseas Trade.

In his introduction to the report, Mr. Phillpotts says that the period of inflation, followed by one of severe industrial depression, is now passing, although industry and trade are still more or less in a condition of stagnation. Meanwhile the important results of the reconstruction scheme, the stabilisation of the currency, and the practical elimination of the deficit in the State finances, have not been affected. These would not in themselves be sufficient if the general economy of the country—the relation of production to consumption—were unsound, but they form the indispensable basis for any permanent solution of Austria's problems.

As happens in other countries after a period of inflation and a speculative boom, the general conditions of credit in Austria have been extremely bad since early in 1924. Creditors, both domestic and foreign, have had great difficulty in collecting payments, and there has been a regular epidemic of insolvencies. This has not only affected numerous new firms started to take advantage of the inflation period, but firms of older standing, too, have got into difficulties. The general shortage of capital and the high rate of loan interest is proving fatal to many concerns.

Trade and Industry.

A new tariff was put into force at the beginning of the current year; rates are in most cases higher, in many cases much higher, than those that have hitherto been in force, but they are, however, still considerably lower, generally speaking, than those in neighbouring countries. The import of certain British goods, including radio apparatus, will be affected by the increased duties. The Commercial and Shipping Treaty between this country and Austria was finally ratified in February last, and this should aid in the return to the pre-war trade conditions between the two countries. Commercial treaties have also been negotiated with Czecho-Slovakia, Germany, and France. Industrial depression and

* Stationery Office. 1s. 6d. net.

unemployment have been very prevalent of late (the report is revised up to August, 1925), but the iron and steel industry shows an improvement. Production in the first quarter of the current year was considerably greater than in the latter part of 1924, though it did not equal that of the first quarter of that year. Although the bulk of the imports of finished British goods into Austria consists of textiles, there are other important items. During 1924 machines and apparatus to the value of £63,500, electrical apparatus to the value of £65,000, and "other instruments not musical" to the value of £54,000 —an increase of £40,000—were supplied by Great Britain. The last increase is attributed partly to the greater imports of radio apparatus. The exports of incandescent lamps to the United Kingdom fell from £77,000 in 1923 to £62,000 in 1924. It is stated that Austrian exports to the United Kingdom during the first quarter of 1925, as well as trade in the opposite direction, showed substantial increases.

Mr. Phillpotts says that the share of the United Kingdom in Austrian trade has risen, and is likely to rise further at the expense of the Succession States, and he considers that Austria will probably continue to provide an expanding market for British trade.

An appendix to the report showing Austria's exports during 1923 and 1924 includes the following items:—Electrical machinery and blow lamps: 1923, 26,067,000 gold kronen; 1924, 45,383,000 kr. Electrical apparatus and accessories: 1923, 12,438,000 kr.; 1924, 23,238,000 kr. These goods were supplied chiefly to Germany, Czecho-Slovakia, and Jugo-Slavia.

Hydro-electric Development.

Great importance has been attached in Austria, since the war, to the exploitation of the ample water power available in the Alpine districts, both for electrifying the railways and for industrial and other purposes, owing to the country's dependence upon foreign coal and oil. The total available water power in the country is calculated at 1,657,000 h.p. at minimum low water, or probably 3,500,000 h.p. yearly mean, of which under 10 per cent. was harnessed at the end of the war. The provincial governments took up the matter, and between 1920 and 1923 separate companies were founded for all the different provinces. The original capital was provided in the country by local authorities, banks, and the public. When this was exhausted, endeavours were made to obtain further capital from abroad, and as soon as the beneficial effects of the League of Nations Control became obvious, a good deal of foreign money was invested in some of the provincial companies, chiefly Italian, American, and Swiss, and some British, in Salzburg. More would have been available if Austrian companies had been willing to place orders abroad for equipment, but as Austria is well able to supply this herself the work has been done in the country. The provincial companies have undertaken a number of large works of several thousand h.p. each, involving big dams, large tunnels or pipe lines, and long power transmission lines. Other important works are being carried out by the Austrian Federal Railways and private companies, and altogether in the years 1921 to 1924, 68 works of over 500 h.p. each, totalling 214,300 h.p. (yearly mean) were commenced. At the end of 1924, 28 of these works (85,000 h.p.) had been completed, and in the first half of the current year a further 18,000 h.p. was added by the opening of the works at Opponitz, in Lower Austria, and at Teigitsch, in Styria, each delivering over 9,000 h.p.

In 1921 the Austrian authorities drew up a 15-year programme of hydro-electric works, aggregating 900,000 h.p., but it is unlikely that this programme will be fully realised in so short a period.

Railway Electrification.

The last 12 months has seen the completion of nearly all the first part of the railway electrification programme in the west of Austria, which was laid down in 1920. Electric traffic began on the Salzkammergut line between Atnang and Steinach-Irdning (108 km.) in July, 1924, and in May this year the electrification of the Arlberg line was carried as far as Bludenz in Vorarlberg(161 km.), so that electric trains now run all the way from Innsbruck through the Arlberg tunnel, and to within 30 or 40 km. of the Swiss frontier. The remaining short distances to the junctions with the Swiss electric lines at Bregenz and Buchs will, it is expected, be completed some time in 1926. Apart from the saving of time which this electrification will effect, it is calculated that about 130,000 tons of coal will be saved annually.

Early in 1925 the Austrian railway administration endeavoured to arrange for a foreign loan to carry out the next stage of the programme, chiefly the lines between Innsbruck and Salzburg. The Control Committee of the League of Nations refused permission for a new loan, but later sanctioned the release of 18 million dollars of the League of Nations Loan for this purpose. This sum is to cover the electrification of 306 km., and it is expected that the electrification of the lines will be completed by the end of 1928.

The necessary power is obtained partly from water-power works constructed specially for the purpose, such as the Spullersee in Vorarlberg, but in the future it will be taken also from the works built by the provincial companies, such as that on the Achensee. The Austrian railways employ the single-phase system at a frequency of 16⅔, and a pressure of 15,000 V. This system is also used in Bavaria—a fact that will facilitate through traffic with Germany.

The Electrical Import and Export Trade of Hungary.

THE following table gives particulars of Hungary's imports and exports of electrical machinery and apparatus in 1924, the total values in gold crowns being stated, together with the total weights in quintals and the weights by countries of origin and destination. Where available, comparative figures for 1923 are also given. It will be noticed that owing to the lack of detailed classification in 1923, the weight of "Electrical apparatus not elsewhere mentioned" appears disproportionately high as compared with 1924.

	1923. Imports.	1923. Exports.	1924. Imports.	1924. Exports.
Dynamos, transformers and parts.—				
Value in 1,000 gold c'w's	—	—	1,301	3,1
Weight in quintals ...	4,129	17,172	6,511	14,2
Austria	1,745	995	3,077	2,8
Czecho-Slovakia ...	985	571	684	6
Rumania	70	2,082	84	1,0
Germany	869	197	2,283	2
Italy	321	2,700	113	4,9
Belgium	—	—	6	1,8
Holland	—	—	22	7
Poland	—	—	—	8
Telegraph, telephone, and signalling apparatus.—				
Value in 1,000 gold c'w's	—	—	216	1,3
Weight in quintals ...	—	—	373	2,6
Austria	—	—	71	1
Rumania	—	—	—	1,3
Jugo-Slavia	—	—	—	5
Germany	—	—	163	
Bulgaria	—	—	—	4
Meters and parts.—				
Value in 1,000 gold c'w's	—	—	895	1,6
Weight in quintals ...	—	—	663	1,9
Austria	—	—	150	4
Czecho-Slovakia ...	—	—	10	
Rumania	—	—	2	1
Jugo-Slavia	—	—	9	1
Germany	—	—	491	5
Italy	—	—	—	9
Switches, contacts, &c., and parts.—				
Value in 1,000 gold c'w's	—	—	234	3
Weight in quintals ...	—	—	701	1,1
Austria	—	—	212	1
Rumania	—	—	—	2
Jugo-Slavia	—	—	—	1
Germany	—	—	461	4
Incandescent electric lamps.—				
Value in 1,000 gold c'w's	—	—	253	9,7
Weight in quintals ...	672	12,056	588	15,4
Austria	45	964	70	1,7
Czecho-Slovakia ...	15	893	33	1,5
Rumania	—	924	—	6
Jugo-Slavia	—	493	5	6
Germany	612	2,576	479	2,3
Belgium	—	—	—	1,0
United States	—	—	—	2,6
Electrical apparatus not elsewhere mentioned, including arc lamps.—				
Value in 1,000 gold c'w's	—	—	678	7
Weight in quintals ...	3,249	8,456	1,601	1,7
Austria	977	255	598	2
Rumania	—	2,973	—	3
Germany	2,192	297	934	3
Poland	—	211	—	1
Cables and insulated wire.—				
Value in 1,000 gold c'w's	—	—	59	3
Weight in quintals ...	366	718	264	1,3
Austria	155	2	100	
Rumania	—	433	—	7
Germany	—	—	142	1
Great Britain ...	—	—	—	1
Accumulators and plates.—				
Value in 1,000 gold c'w's	—	—	22	2
Weight in quintals ...	—	—	144	2
Austria	—	—	92	
Rumania	—	—	—	
Jugo-Slavia	—	—	2	1
Electric carbons.—				
Value in 1,000 gold c'w's	—	—	35	
Weight in quintals ...	272	49	173	1
Austria	137	39	89	
Germany	—	1	51	
France	16	—	26	

The Pacific Cable Board.

Annual Report and Accounts.

THE annual report and financial statement of the Pacific Cable Board, which is representative of the British, Canadian, Australian and New Zealand Governments, for the year ending March 31st, 1925, outlines the year's working and shows that the receipts (£549,917) exceeded the ordinary working expenses (including the normal payment of £30,000 to the reserve and renewal fund) by £254,589. After taking account of the annuity of £77,544, payable to the National Debt Commissioners in respect of interest and repayment of capital, and the annuity of £9,150 payable to the reserve and renewal fund in respect of interest and repayment of money borrowed from that fund for the Sydney-Auckland cable (1912), a surplus of £167,893 remained, the whole of which has been devoted to the reserve and renewal fund. The traffic receipts (£535,013) were less by £9,768 than those of the previous year. This falling off is accounted for partly by rate reductions which were introduced on December 1st, 1924, and partly by a reduction in the volume of ordinary traffic. The expenditure (excluding special appropriations) was less by £5,682 than that of the preceding year, and the total assets of the reserve and renewal fund amounted to £2,279,826.

The forthcoming duplication of the cables between Vancouver Island and Fiji will involve expenditure of approximately £2,400,000 and the work will not be completed until the end of September, 1926. It is expected that during the period the reserve and renewal fund will be sufficiently strengthened to meet the cost of duplication in full. The effect of the reconstruction of salary scales has been to increase the liabilities of the pension fund and the net sum provided to cover the increased liabilities was £6,600.

The depôts, instruments and plant generally, have been maintained in a high state of efficiency. The cable between Norfolk Island and Southport became interrupted in the vicinity of Southport on June 13th and was repaired by the *Iris*; on June 27th a fault declared itself on the same cable in the vicinity of Norfolk Island, and a new shore end was laid out from Norfolk Island by the *Iris*. As the Board's facilities between Fiji and Australia enable traffic to be directed by three different routes, the disturbances did not cause any inconvenience to the Board's business. A new tri-core shore end was inserted by the *Iris* at Suva on the Fanning Island section in November, 1924. This completed the provision of tri-core shore ends on both sides of each of the long cables.

The Board was occupied throughout the year under review in giving consideration to the duplication of its system in the Pacific, and contracts have been placed (*a*) with the Telegraph Construction and Maintenance Co., Ltd., for the Vancouver Island-Fanning Island section; (*b*) with Messrs. Siemens Bros. and Co., Ltd., for the Fanning Island-Fiji section. The contractors have undertaken to complete the laying of these cables by September 30th, 1926. The new cables will be continuously loaded with a metallic alloy of high permeability and their guaranteed traffic transit capacity is more than twice as much as the capacity of the existing cables, and it is expected that in practice the guaranteed capacity will be largely exceeded. The total cost of the cables laid in 1923 (*a*) Suva-Auckland (direct) and (*b*) Southport-Sydney, including equipment and engineers' fees, amounted to £337,940.

The total expenditure on the wireless investigations at Vancouver Island and Fiji (referred to in the report for 1922-23) amounted to £7,155, and the investigations established that the reception possibilities in the localities referred to were satisfactory, but in view of the cost of running wireless stations, as compared with the extra cost of working duplicate cables, and of the difficulty of securing secrecy and the certainty of continuous communication, it was ultimately decided to complete the duplication of the cables.

The landlines leased by the Board from the Canadian Pacific Railway Co. worked well and the service on the landline which is allocated by the Australian Commonwealth Government for the exclusive use of the Board was generally satisfactory, but was affected during the latter part of the year by reconstruction work. The laying of the cables in the British West Indies and British Guiana was completed in July, 1924, and the last of the wireless stations was handed over by the contractors in February, 1925. Owing to the wireless stations not being completed, it was necessary to postpone the opening of the system until December 1st, by which time arrangements had been made for telegraphic communication with all the islands.

The office and residential property at the various stations has been maintained in a satisfactory state of repair. The new concrete office building at Suva was completed in September, 1924. The vessels of the Union Steamship Co. of New Zealand made five calls at Fanning Island, the total expenditure during the year on this service having been £10,886. The Board's cable maintenance vessel *Iris* continues to be maintained in first-class order. No changes in the membership of the Board took place during the year under review.

Mr. John Milward, the Board's manager in the Pacific, and chief electrician, retired on pension in August, 1924, having reached the age of 60. He had occupied a prominent position in the Board's service from the time the system was first opened. No successor has so far been appointed as manager in the Pacific, and Mr. R. I. S. Bain, the Board's senior superintendent, has been acting in that capacity since Mr. Milward left Australia. In future the position of chief electrician is to be kept distinct from the management. Owing to the growth of the Board's business it is not possible for the manager, who is mainly occupied with administration work, to devote the requisite attention to the technical side which is required of a chief electrician. Mr. G. B. Winkfield, who had been Mr. Milward's principal assistant in technical matters, has been appointed chief electrician. Two superintendents, Mr. T. R. Blackley and Mr. Alfred Smith, reached retirement age during the year under review and withdrew from the service on pension; the vacancies have been filled by the promotion of Mr. T. F. Price and Mr. J. Sherlock.

The Board has notified full adherence to the International Telegraph Convention which it has not hitherto been able to do owing to the fact that its connecting administrations across the Atlantic did not adhere in every respect. The rates for ordinary messages between the British Isles and Canada, on the one hand, and Australia and New Zealand, on the other hand, were reduced on December 1st, 1924; the reduction of receipts resulting from this cut is estimated at £35,000 per annum.

On May 1st, 1924, a night letter service was introduced for traffic exchanged between Australia and New Zealand and was extended on December 1st, 1924, to traffic between Fiji and Australia and New Zealand.

Some sensational results obtained in handling urgent-rate messages conveying to the news agencies in London results of cricket tests matches in Australia are worthy of record. For days at a time the delay on urgent-rate telegrams was never more than four or five minutes, and on several occasions was as low as one minute.

During the year approximately 11,900,000 paying words of international traffic (*i.e.*, traffic other than local messages between Australia, New Zealand, and the Pacific Islands) were transmitted across the Board's system; this was approximately 550,000 words above the total of the previous year, and established a further record. The ordinary or full-rate international traffic showed a falling off of approximately 105,000 words, week-end telegrams 145,000 words, and Press messages 250,000 words.

There was an increase of 36,000 words in the deferred ordinary international traffic, of 17,000 words Government, and of nearly a million words of daily letter telegram traffic. The increase as regards daily letter telegrams was for a whole year, as compared with only seven months of the previous year. The daily letter telegram service proved exceedingly popular, and the falling off of the ordinary and week-end traffic was no doubt accounted for by the use which was being made of the cheap "daily" service.

In addition to the international traffic, approximately 2,700,000 paying words were carried between Australia and New Zealand and between those Dominions and the Pacific Islands; this is approximately 600,000 words more than during the previous year. Ordinary local traffic was less by 240,000 words than that of the previous year, but the new service of night letter telegrams produced 868,000 words, and no doubt the introduction of this new service accounted for the reduction in the volume of ordinary traffic.

Hydro Electricity in Norway.—Before a meeting of the Polytechnical Association in Oslo in October, which was attended by the King and Ministers of State, Engineer Ove Collett discussed the reasons why Norwegian water powers were not being developed for industrial purposes. He stated that it had been a great disappointment that so little progress had been made in the further utilisation of the water powers and the consequential industries. Norway had the cheapest water power in the world, but it did not possess a stable value. If it were desired to render the water powers fertile it was necessary to get wealthy foreigners to take an interest in these powers. The only foreigners who had provisionally entered the field since the war had acquired at low prices the Hoyang, Tysse and Sundlokken undertakings, but not a single additional horse power of plant had been installed. Yet some millions were awaiting to be brought into use. Foreign power consumers were turned away from the idea of developing the water powers because of labour conditions, taxes, concession conditions, &c. Although the Norwegian fixation of nitrogen industry had had a favourable course at first, it was now in a difficult position and only produced some 28,000 tons per annum in various forms. On the other hand, in Germany a great industry had been developed and was now able to turn out about 400,000 tons of nitrogenous fertilisers per annum. At the close of the war there were from 25 to 30 undertakings engaged in the electrochemical industry in Norway; nine of these had been compelled to cease operations. Except the known aluminium and nitrogen works only one of the others had yielded any dividend since the war. During the discussion it was also submitted that taxes had reached an undue height and that the conditions under which concessions were granted ought to be ameliorated.

New Electrical Devices, Fittings and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

A New Speed Controller.

A new motor speed controller particularly suitable for use with stokers, conveyors, travelling ovens, &c., has been developed by the Louis Allis Company, Milwaukee. The device, (fig. 1) the "Allis Adjustable Delivery Motor Drive," consists mainly of three elements, the L-A multi-speed, squirrel-cage, a.c. motor, a revolving drum for establishing the average speed, and contactors for switching the motor. In the operation of the drive a fractional-h.p. motor is used to revolve the selector switch drum at 1 or 2 r.p.m. By changing the position of a movable brush, a two-speed motor, for instance, can be made to run all the time on the high speed, all the time on the low speed or any desired portion of the time on the high or low speeds. By choosing a motor the high speed of which is higher, and the low speed lower, than it is ever desired to run, an infinite number of steps can be obtained.

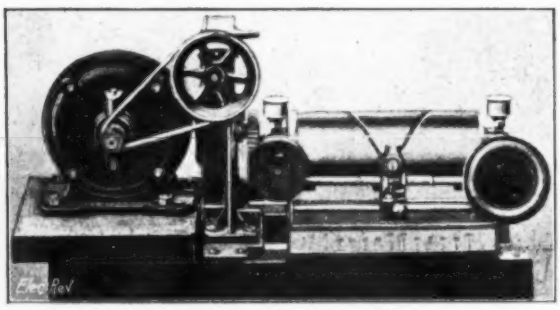


Fig. 1.—Motor Speed Controller.

A Portable Cable Testing Plant.

The accompanying illustration (fig. 2) shows a rather interesting portable generating plant that the ASTER ENGINEERING CO. (1913), LTD., of Wembley, Middlesex, has recently constructed to the order of British Insulated & Helsby Cables, Ltd., for supplying electricity for high-pressure testing apparatus in connection with cable installations.

The design of the set is such that it can be towed at high road speeds, thus constituting an extremely mobile plant. Suspension is on approved automobile principles, the set being carried on a single axle fitted with 820 by 120 mm. pneumatic tires and mounted on semi-elliptic springs. The towing eye is adjustable in height to facilitate attachment to lorries of varying loading heights. Accommodation is provided for a spare wheel, complete with a tire, and the equipment is enclosed in a sheet-steel casing with a hinged side panel, and is therefore entirely waterproof. The chassis is provided with two adjustable drop legs at the forward end and with a square thread jacking screw at the rear end to keep the set rigid when in operation. The jacking screw is also capable of lifting the set sufficiently to enable a wheel to be changed.

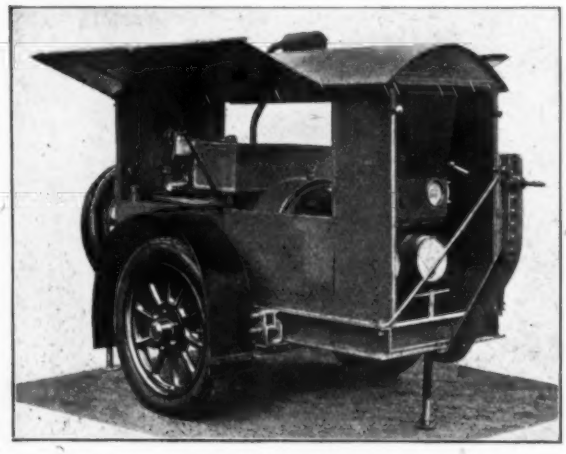


Fig. 2.—Cable Testing Plant.

The generating set consists of an "Aster" high-speed four-cylinder petrol engine, type 43 DMI, developing 12 b.h.p. at 1,500 r.p.m., coupled through flexible coupling to a Crompton alternator, developing 6 kW, 220 volts, 50 cycles. The switchboard consists of an enamelled slate panel mounted on a frame designed to minimise road shocks, and carries a d.p. overload and no-volt circuit breaker with suitable fuses, and an 8-in. dial voltmeter and ammeter; also a back-of-board regulator.

Spares for the engine and alternator, together with tools, are contained in a locker; an oil storage drum and foot tire pump are also provided. The circulating water of the engine is cooled by a radiator mounted in front of the equipment, the fan of which is adjustable for belt tension. The fuel tank is mounted beneath the canopy, the exhaust being led to the silencer mounted on the top of the canopy. The equipment operates in conjunction with special high-pressure apparatus. Amongst other special portable generating sets produced by the company mention may be made of a 30-h.p. self-propelling electric-arc welding set.

A New Fitting Suspension Method.

We have received from MESSRS. FALK, STADELMANN & CO., LTD., Veritas House, Farringdon Road, London, a sample "Holdrite" pendant set, fig. 3. This is a recent production of the firm in which is employed a new method of suspending one-piece glass electric lighting fittings. The suspension device consists of two semi-circular metal saddles sustaining the globe in a lip at the top. The saddles are clamped at the ends, where they are held by a dual chain suspension. The cover which holds the lamp holder and lamp merely rests on the top of the globe, and renders the interior of the fitting nearly dustproof. The "free" cover has the great advantage, when replacing or cleaning the lamp, &c., that it can be handled independently of the globe. The duplex saddle is designed to accommodate the varying flange contours which occur in a given type of fitting, by means of adjusting nuts at the clamping connections. Vibration troubles are guarded against by virtue of the saddles sustaining the globe round the whole of the lip. This also provides for glass expansion, it being unnecessary to clamp the saddle tightly to the fitting. It is claimed that the "Holdrite" method of suspension for heavy globes is the first practical one to be employed without gallery screws, &c.

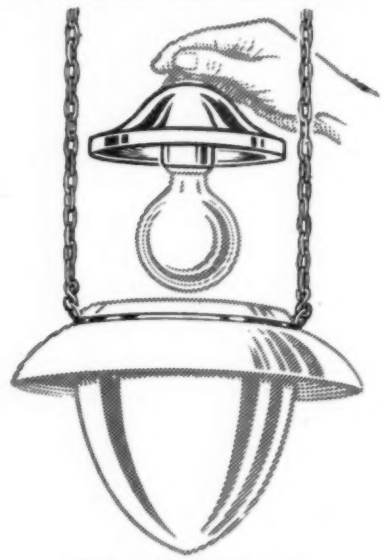


Fig. 3.—"Holdrite" Suspension.

A New Insulating Material.

We have received from THE SILUMINITE INSULATOR CO., LTD., The Green, Southall, Middlesex, some particulars of a new insulating material, "Siluminite, grade 2," which it has recently produced. It consists of a certain silica asbestos base and a small amount of phenol formaldehyde condensation product. It is claimed that this material greatly increases the mechanical strength and electrical insulation, and at the same time produces a finished product which is non-absorbent and capable of withstanding a discharge over the surface for a given period without carbonisation taking place. At the present time the material is made in sheet form in sizes 30 in. by 40 in., with a minimum thickness of $\frac{1}{8}$ in. It is also claimed that at high temperatures softening or change of shape does not take place, blistering is impossible, and that the material is fireproof. A copy of a report on the tests made on two samples of this material at Faraday House shows the specific resistance of a sample (dry), 1.48 cm. thick, to be 4.3×10^6 megohms; also that of the same sample, after 24 hours' immersion in water, to be 1.9×10^4 megohms. Another sample, 1.47 cm. thick, showed a specific resistance of 3.5×10^6 megohms when dry. Breakdown pressure tests gave a result of 27,900 V from the 1.47 cm. sample when dry, and 26,700 V for the 1.48 cm. sample after 24 hours' immersion. In another test a carbon arc was passed along the surface of a sample two or three times, and the insulation resistance was measured between two points of the treated surface with an "infinity" result. There did not appear to have been any carbonisation, nor did the material burn or lose its shape.

The Development of Electric Power Supply.

By R. W. GREGORY.

(*Abstract of the Chairman's Address;* NORTH-EASTERN CENTRE *of the* INSTITUTION OF ELECTRICAL ENGINEERS.)

I HAVE often felt that an essential part of a chairman's address should be a plea of justification for the continued existence of the profession to which he belongs. Throughout the ages, the principal justification for the existence of the engineer has been that he has made it possible for large numbers of people to live together more or less healthily in towns and cities. The present trend of engineering appears to be towards making it possible for the rustic to obtain many of the services which in the past were only obtainable in the smoke-laden air of the city.

I sometimes wonder whether we English are as enterprising a people as we like to think ourselves to be. The country appears to be hampered with a load of existing capital works and legal restrictions which in the electrical industry at least prevent her from getting on with the business as quickly as she ought to. Whatever England does in the practice of electrical development may have little effect on the rest of the world, but a large effect on England herself. The reluctance of our home railways to electrify their main lines may be justified by the economies of the moment, but it is conceivable that the electrification of British main lines would have far-reaching effects on our foreign and Colonial trade in railway electrification material.

Rural electrification, however, is more within the sphere of operation of the electric supply authorities, and deserves the study of all supply engineers. The characteristics of rural loads are that they are sparsely distributed and small in quantity; the capital cost per kW connected must therefore be larger than in the towns and industrial areas, and the essential to the solution of the problem is the reduction of the capital cost even at the expense of the service given.

At the recent conference in Newcastle, of the Institute of British Architects, sorrow was expressed at the manner in which Dobson's classic façades had been treated by the men who worked behind them. I join issue with the architects by saying that they should design their industrial buildings to allow signs and letters to be applied so as to enhance the architectural effect. Those of us who have seen the effect of flood lighting on some of the business buildings in other countries know how electricity and architecture can combine to make advertising beautiful. There is an even more important question to consider than that of night signs in which we should join forces with the architect. The outstanding characteristic of the majority of our industrial towns and cities is their darkness and dinginess and dirtiness. We know by the experience of the coal strike a few years ago how different our atmosphere becomes if only we eliminate smoke, and we know that there are ways and means existing which, if generally used, would eliminate 90 per cent. of the smoke which pours daily from our industrial and domestic chimney stacks. For the sake of cleanliness and the health and cheerfulness of the community, everything should be done to encourage the use of smokeless heating systems, of which there are many available. Gas engineers, electrical engineers, and heating engineers together can provide means of heating both for domestic and public buildings, which do not foul the atmosphere, and the general use of these systems would, I am convinced, do more for the general happiness of the community than a dozen Acts of Parliament.

The electric supply industry in Great Britain is at present in a state of rapid development, both technically and economically. The economic trend in generating station practice is towards the large station with a plant capacity of the order of 200,000 kW and with a site of sufficient area to double this capacity. As the efficiency of the large turbine is vitally dependent upon the vacuum obtained by the condensing plant, it is more important to place our generating stations on our estuaries and larger rivers than it is to build them at the coal pitheads. Electricity can be economically generated by steam only near a large supply of pure water; for every ton of coal burned in an electric light and power plant 400 to 600 tons of water must be pumped to condense the steam that drives the big turbines. The longest distance that electricity can be transmitted economically over wires at present and compare favourably with local power is 250 miles. The cost of generating electricity is only about 20 per cent. of the total bill, and the other 80 per cent. is the cost of delivering the service from the power plant to the consumer.

The large generating station brings in its wake increasing problems of control and distribution, and certain branches of this side of the electric supply industry have a little difficulty in keeping pace with the rapid growth of the generating station. Generally it can be said that switchgear and cables are the sections which tend to lag, and transformers and overhead transmission lines are the sections which keep pace with the generating plant. In 1914 the rupturing capacity of generating station switchgear was sufficient to cope with a short circuit on the station without fault limiting devices; to-day it is not. The capacity of the generating plant has grown more rapidly than the rupturing capacity of the circuit breakers controlling these plants. The 200,000-kVA station has arrived; the 2,000,000-kVA circuit breaker has not; for the reason that it is rare that the circuit breaker can be tested out as a breaker under service conditions. It is possible now to obtain from most of the reputable manufacturers circuit breakers with a normal rated rupturing capacity of upwards of 1,500,000 kVA. The general trend in the use of such circuit breakers is to limit their duty to a figure well inside their rated rupturing capacity. This is done, first, by so laying out the gear that a short circuit between phases in the precincts of the generating station is practically impossible.

The interest in metal-clad switchgear design has spread beyond this country, and is now world-wide. It is already being manufactured for the American market by Allis Chalmers of Milwaukee, and I don't think I am far wrong in stating that other switchgear manufacturers in America have designs in store ready to meet their almost certain home demand for this type of gear. Could not the larger switchgear manufacturers combine to provide a proving house which is worthy of the industry and the country? The organisation, to make such a venture possible, already exists. The labours of a well-equipped research laboratory would hasten the day when the breaking of an electrical circuit will not be explosive. What are the possibilities in this direction of devices like the automatically variable reactance or even of the thermionic valve?

The art of cable making and cable using is at present in a wonderfully interesting state of development, and the increased knowledge of dielectric phenomena now available has so widened the field of vision of the lead, paper and compound engineer, that he is endeavouring to turn out cables for use at pressures which, in the past, could only be applied to bare conductors hung on insulators.

Power transformer design continues to keep pace with the developments in other sections of the industry. Transformers can be built of capacities equal to that of the largest generators and for use with voltages as high as can be dealt with by the transmission lines. One of the primary problems of transformer design is that of the coiling of the windings to maintain the insulation, which resolves itself into knowing all about the "hot spots" which determine the rating of the transformer.

The oil temperature loading basis is one of great importance to the transformer user. In the largest transformers the heat generated by the losses is extracted from the oil either by water or forced air. A characteristic of the time, however, is the rapid increase in the sizes available of "self-cooled" transformers.

Overhead transmission lines, as now constructed, are remarkably reliable, and the best insulators now appear to possess a reasonable life even under the high mechanical and electrical stresses to which they are subjected. The main enemies to continuous service are birds and lightning. We know of bird troubles in this district, and "crow guards" are an essential part of the construction of our high-pressure lines. In India many of us have heard of delays to service caused by crows building nests on cross arms and pole tops, the nesting material sometimes being the scrap ends of armouring wire left from underground cables being laid in the district. Lightning is still a source of income to the trouble man and to the manufacturer of protective apparatus. The general experience seems to be that the higher the working pressure of the line the less liable it is to lightning troubles. Lines of over 100,000 V working pressure are practically immune from lightning troubles. It is uneconomic, however, to insulate all lines and the apparatus connected to them for this pressure, so the lightning problem resolves itself into the protection of the line insulators against destruction from arc-overs, and the protection of the insulation of the apparatus connected to the line. The protection of the apparatus connected to the line is obtained more or less successfully by the use of lightning arresters of many types, the best known of which are the electrolytic and the oxide-film arresters which act as safety valves against over-potentials. The wider knowledge of high-frequency phenomena now available from radio research and experience also helps in the attack on this problem, and it is probable that lightning and surge protection will ultimately be achieved by apparatus connected directly in the line, which will absorb the energy of the surge before it reaches the apparatus to be protected, and without any power current leaking to earth; that is, the line will not be shut down even temporarily when under the influence of lightning. The Campos arrester, well known in Italy, and the Grant surge absorber described by Captain de Ferranti at the recent Paris Conference are examples of this type of protective gear. The problem of the day, however, in this country, is not the construction of first-class, high-grade, high-pressure lines, but the construction of cheap high-pressure distribution lines which would enable the supplies to be given economically to farms, villages, and sparsely-loaded districts. The use of conductors of high tensile metals such as steel and silicon bronze in place of copper

or aluminium helps a little towards cheapening the lines. We, of course, have to remember that cheap overhead distribution as carried out in America is constructed to what might be termed agricultural engineering standards.

There has been much said recently on the desirability of easing the various regulations and restrictions which govern the construction of British overhead lines. These regulations and restrictions certainly do keep up the cost of our high-pressure overhead lines, and reasonable proposals for their modification are worthy of consideration by the authorities. The cost of rural high-pressure overhead lines could be considerably reduced if the figures for ice loading specified in the regulations were modified.

For transmitting quantities of power, overhead lines are less than half as costly as underground cables. The engineering difficulties of laying cables are increasing with the use of higher pressures and with the heavier and more elaborate road construction now required for modern traffic.

Probably the most notable development during the last few years is the automatic converter sub-station which has been made possible by modern improvements in the design of rotary converters and protective and control gear for them. It is now possible to obtain commutating machines which are practically unaffected by dead short circuits on their terminals. It is now generally accepted that a properly designed automatic sub-station, because it eliminates many of the chances of human error, which occur particularly at critical times, is more reliable in its service than a manually operated sub-station, and its employment can be economically justified, not only in districts where the standard of intelligence and the wages of the sub-station attendants are high, but also in districts where the standard of intelligence and the wages of the sub-station attendant are low; for example, the automatic sub-station is commercially and technically sound both in America and India.

The long-tried and popular rotary converter has, during the last few years, received a challenge from a new rival—the mercury arc rectifier. At the present time the capital cost of a rectifier installation is not less than that of a rotary converter installation to do the same duty, and its claims for justification can only be based on such factors as efficiency, simplicity, and reduced maintenance costs. Whether these factors are sufficiently strong to eliminate the more tried out, old-established rotary converter for railway work, it is perhaps too early to say at the present time.

Legal.

Alleged Radio Valve Theft.

At Nottingham, on October 25th, E. Morris was committed for trial (bail being allowed) on a charge of stealing radio valves valued at £158, the property of the General Electric Co., Ltd., Nottingham. F. S. Freeman and J.C. Baker were also committed on a charge of receiving the valves.

Postmaster-General v. Ford.

At the Marlborough Street Police Court, on October 28th, the Postmaster-General (represented by Mr. Percival Clarke) summoned Mr. R. M. Ford, Albert Gate, S.W., for having installed and worked a radio receiving set without a licence. In reply to Mr. Hay Halkett, the magistrate, the defendant said that it would be a long case, but the prosecution could not agree that this was necessary. Mr. Ford said that he had a long statement to make involving many considerations, and the case was adjourned until November 12th.

Tucker v. Wandsworth Manufacturing Co., Ltd.

In the Court of Appeal, consisting of the Master of the Rolls and Lords Justices Warrington and Sargant, on October 28th and 29th, this case was heard upon the appeal of the defendants from the judgment of Mr. Justice Tomlin, holding that the appellants had infringed Mr. John Bristow Tucker's patent for improvements in electrical switches, No. 186,408 of 1923.

The first claim in plaintiff's specification was for a switch with quick-make and quick-break action by virtue of a compression spring pivotally operating, on the one hand, on a contact arm and, on the other, with an operating member, which was utilised for positively displacing the contact arm in the operations both of making and breaking in the event of the spring failing to act or to act effectively. The second claim was for a specific tumbler switch, though the inventor did not limit his invention to any particular form of switch.

Mr. Tucker alleged that the defendants had infringed both the claims. The defendants denied infringement, and alleged that the plaintiff's patent was invalid by reason of prior specifications, prior user, and common general knowledge.

Mr. Justice Tomlin held that the plaintiff's first claim was not valid, but that the defendants' switch was an infringement of the plaintiff's second claim.

The proceedings in the lower Court were reported in our issues of July 10th (p. 53); July 17th (p. 119); and August 7th, 1925 (p. 238).

Sir A. Colefax, K.C., and Mr. Courtney Terrell appeared for the appellants; and Mr. Whitehead, K.C., and Mr. Moritz for the respondent.

Sir Arthur Colefax contended that there was no subject matter for a patent with regard to the plaintiff's second claim having regard to general common knowledge, and that the judgment of Mr. Justice Tomlin was wrong in that respect, and that the appellants were entitled to succeed.

Mr. Whitehead, for the respondent, supported the decision of Mr. Justice Tomlin. He contended that there was invention in what the patentee had done. He said it was necessary to devise a switch which would be certain and quick in its operation in order to prevent arcing. The patentee had, counsel submitted, solved a new problem. The evidence was that tumbler switches had been made for 30 years. The respondent had been making them for about 25 years, and the defendants had been making them since 1904. If respondent's claim 2 was to be broken at all and held to be invalid it would have to be on the grounds of want of subject matter. To succeed on that the defendants must prove that what the patentee had done was obvious having regard to the state of the art.

Lord Justice Warrington said that the respondent did not say or pretend to say that he had solved any special problem of tumbler switches.

Mr. Whitehead replied that he had claimed a tumbler switch which he had described and illustrated, and no other. In claim 1 he had said too much, with the result that Mr. Justice Tomlin had found that the claim was invalid. He (counsel) contended that neither Cox, Rose, nor Crabtree had anticipated the problem which the respondent had succeeded in solving.

At the conclusion of the arguments their Lordships allowed the appeal.

The Master of the Rolls, in giving judgment, said the action was brought to establish that there had been an infringement by the defendants of the plaintiff's patent, and to obtain an injunction and damages. Mr. Justice Tomlin had held with regard to claim 1 of the plaintiff's specification that the patent was invalid, but that claim 2 was a valid claim, and that he (the Judge) could exercise his discretion under the Patents Act, 1919, and allow an amendment by striking out claim 1 and holding that the plaintiffs could obtain an injunction and damages.

Dealing with the plaintiff's amended specification, his Lordship said that claim 1 was admittedly a wide claim. The patentee indicated that the tumbler switch was an embodiment of his invention but not the sole object of his invention. Mr. Justice Tomlin, upon the evidence, came to the conclusion that plaintiff's first claim could not be limited to tumbler switches, and he (the Master of the Rolls) agreed with him. With regard to claim 2 the Court had to give effect to the whole body of the specification and the illustration. The claim was not for a "tumbler" electric switch, but for an "electric switch substantially described as herein set forth and illustrated." He thought the claim was a wide claim and not a narrow one. Mr. Justice Tomlin had held that claim 1 had failed for want of subject matter and novelty, and he (the Master of the Rolls) thought that claim 2 failed for a like reason. Accordingly he thought it was impossible to hold that claim 2 was valid. In his opinion the appeal must be allowed and judgment given for the defendants with the costs of the action and the costs of the appeal. If it had been necessary to decide the question of infringement he would have felt some difficulty in holding that there had been any infringement by the defendants.

The other members of the Court delivered judgment to the same effect.

Attorney-General v. Southern Counties Electric Light and Power Supply, Ltd.

This action came before Mr. Justice Tomlin in the Chancery Division on October 27th for judgment in default of defence.

Mr. Wilfrid Hunt, for the defendants, however, applied for an adjournment. He said that a mistake had been made. The defendants had a defence but it had not been delivered in time. If, however, his Lordship would not adjourn the case he could deliver a defence immediately.

His Lordship said he would give the defendants a week; he could not enter judgment for the plaintiff when there was a defence to the action.

The action was at the relation of the Battle (Sussex) Urban Council for an injunction restraining the defendants from breaking up Battle High Street or any other road or path so as to cause obstruction or damage.

German-American "Bosch" Litigation.

The hearing of this case, the opening of which was reported in our last issue, was resumed on October 27th, when Counsel on both sides read the evidence on which the Registrar gave his decision.

His Lordship asked if there was any evidence that Bosch magnetos were made in England.

Sir A. Colefax said there was evidence that during the war some magnetos were made in England and stamped "Bosch" in England.

His Lordship: Were they made by a firm in which Robert Bosch was interested?

SIR A. COLEFAX said that 700 were made by the then English company in 1915.

Mr. ARTHUR T. MURRAY, president of the American Bosch Magneto Corporation, was called, and gave evidence of the export from American to this country of motor-cars equipped with their magneto. Cross-examined by Sir DUNCAN KERLY, K.C., for the German company, witness said the general practice in America was to use battery and coil ignition. The presence of a magneto on an American car was unusual except in cars for export.

Counsel suggested that the result of all the importation of American Bosch magnetos into this country either as separate articles or on cars only amounted at most to a few thousands, and that it was wholly negligible in comparison with the Stuttgart trade.

The witness replied that during the last five years 60,000 electrical units had been imported with his company's name on them. In reply to Counsel, witness said that "electrical units" did not mean sparking plugs, but batteries, distributors, coils, &c.

The hearing was adjourned and was resumed on October 30th, when his LORDSHIP said it was plain that for years in this country the American corporation had advertised its own manufactures as "Bosch." It sent thousands of batteries and ignition coils and magnetos all stamped "Bosch."

SIR D. KERLY, K.C. (for the German company): Stamped "American Bosch."

His LORDSHIP: What could anybody suppose it meant; it does not mean German Bosch.

SIR D. KERLY: I will suggest that.

Herr OTTO HEINZ, on behalf of the German company, in reply to Sir D. Kerly, said that in his view a genuine "Bosch" in this country was the product of his company.

As to what it is in America you are engaged in litigation there?—Yes.

The hearing was adjourned until November 3rd.

Radio Instruments, Ltd., v. Plating & Co.

MR. JUSTICE ROMER, in the Chancery Division on October 30th disposed of a motion by the plaintiffs against Plating & Co., Northampton, for an injunction restraining infringement of a licence under a patent for radio transformers.

Mr. SHELLEY, for plaintiffs, said it had been agreed by defendants that there should be a perpetual injunction, and an order for the payment of taxed costs and an inquiry as to damages.

Radio Instruments, Ltd., v. A. J. Hewens & Sons.

MR. JUSTICE ROMER, in the Chancery Division on October 30th, had before him a motion by the plaintiffs for an injunction restraining A. J. Hewens & Sons, High Street, Lewisham, from infringing a limited licence under a patent for radio transformers. Counsel for plaintiffs said defendants had agreed to submit to a perpetual injunction and to pay the taxed costs of the motion and an agreed sum by way of damages.

Nettleton & Co., Ltd., v. Dawes.

IN the Mayor's and City of London Court, on October 29th, before Judge Shewell Cooper, a claim was made by Nettleton and Co., Ltd., advertisement contractors, 126, Moorgate, E.C., against Mr. J. W. Dawes, wireless dealer, Finsbury Park, for £13 due under a contract for an electric sign placed on an electric light standard. The defendant pleaded that the sign was not in accordance with the contract and judgment was entered for him, with costs.

Brown, Douglas & Co. v. Enfield Ediswan Cable Works, Ltd.

MR. JUSTICE FINLAY, in the King's Bench Division, on October 30th, had before him an action brought by Messrs. Brown, Douglas & Co., Export agents, Eastcheap, E.C., against Enfield Ediswan Cable Works, Ltd., claiming damages for alleged breach of two contracts. Defendants denied plaintiffs' allegations, and disputed the claim. Mr. Wingate Saul, K.C., and Mr. T. Beresford were for the plaintiffs, and Mr. Barrington Ward, K.C., and Mr. Cartwright Sharp for the defence.

Mr. WINGATE SAUL, for the plaintiffs, said that one contract was for the supply by the defendants of fifty miles of 1/18 S.W.G. single core cable at £13 15s. per mile, and the other for ten miles of 1/18 S.W.G. single core cable at £13 10s. per mile, the former contract being dated July, 1920, and the second contract January, 1921. The cable was for shipment to New Zealand, of which defendants knew. Defendants in their defence said there was no breach of any of the contracts, because the goods supplied were in accordance with the contracts. They pleaded that there was a clause in the contracts to the effect that the defendants in the case of defective material or workmanship were not to be liable for consequential damages, and that their only liability was to replace the goods. In the correspondence his Lordship would see that the plaintiffs offered to return the goods to the defendants, but the latter refused to accept them. The only difference in the specifications was that the first cable was described as "Non-Association" quality, and the second cable as "Association." The cable was required to have a minimum insulation resistance, and it was in that respect that the cable failed to be in accordance with contract. The claim did not relate to the whole of the cable as some was sold in New Zealand, where it had been shipped, before the results of the tests there were known, and some of the cable had been used for tests. The remainder of the cable, less that which had been sold and used for tests in New Zealand, was sent back to England. Tests were also made in England, and of fifteen coils of the "Non-Association" cable four were below the minimum of 2,000 megohms per mile, and eleven satisfied the minimum, and of twelve coils of the "Association" exactly fifty per cent. were below the minimum of 2,000 megohms per mile.

Mr. WILLIAM H. BALLANTYNE, B.Sc., gave evidence as to the results of tests applied to certain coils and said that they were not up to standard. He did not think the rubber on the cable was perished by having been stored too near the boilers on ship. It did not bear the appearance of having been overheated in that manner. Some coils were bad, but other coils were much above the standard required.

The hearing was adjourned until November 2nd.

Metropolitan-Vickers Electrical Co., Ltd., v. British Thomson-Houston Co., Ltd.

IN the Court of Appeal, consisting of the Master of the Rolls and Lords Justices Warrington and Sargant, on November 2nd, the hearing was commenced of the appeal of the plaintiffs in this case from the judgment of Mr. Justice Lawrence in the Chancery Division, delivered on December 18th last year (*vide* ELECTRICAL REVIEW, December 26th, p. 971).

The plaintiffs, the owners of Letters Patent No. 9,644 of 1912 of an invention of "Improvements relating to synchronous dynamo-electric machines," granted to Emanuel Rosenberg, brought the action for an injunction and the usual ancillary relief, alleging that the defendants had infringed the patent by the manufacture, sale and use of rotary converters constructed in accordance with the plaintiffs' specification. In particular the plaintiffs complained of the sale towards the end of the year 1923 by the defendants to the West Hartlepool Corporation of two 300-kW rotary converters.

The plaintiffs accordingly claimed an injunction to restrain the defendants from infringing their letters patent; damages or an account of profits; and delivery up or destruction on oath of all infringing machines in the defendants' possession or control.

The defence was a denial of infringement or a threat to infringe, and a plea that the plaintiffs' letters patent were invalid upon the grounds of prior publication and prior general knowledge. They pleaded that the plaintiffs' patent was bad for want of subject matter.

Mr. Justice Lawrence dismissed the action, and directed that the defendants should have the general costs of the action and also the costs of the issues raised by the particulars of objections, and the defendants were ordered to pay to the plaintiffs the costs of the issue raised by the particulars of breaches.

Sir Duncan Kerly, K.C., Mr. Whitehead, K.C., and Mr. McEwen attended for the appellants; and Sir Arthur Colefax, K.C., Mr. Trevor Watson, and Mr. Sandeman for the respondents.

Sir DUNCAN KERLY, in opening the proceedings, explained in great detail the invention of Rosenberg as disclosed in his specification.

Bartholomew v. Electrical Distribution of Yorkshire, Ltd.

AT the Rotherham County Court recently, Thomas Bartholomew, Rotherham, sued the defendants for £35 damages. For the plaintiff it was stated that the company's workmen left a shallow trench across a roadway at Maltby. A car owned by the plaintiff passed over this and the back axle was broken. In reply to questions plaintiff said that the car was 15 years old and that it was bought for £25. The case was adjourned.

Aerodrome Lighting.—The installation of a system to enable aircraft to land safely in fogs has just been started at Croydon, the London air station. According to the *Daily Mail*, in parallel lines across the aerodrome trenches are being dug and in these neon light-tubes are to be sunk. This form of light, with its brilliant reddish hue, effectually penetrates fog. Above the lights, and flush with the ground, there are to be thick plate-glass covers, so that aeroplanes can taxi over them without damaging the glowing tubes beneath. Between the light-tubes there is to be laid a section of leader cable. After being guided by directional wireless to the aerodrome, the airman, flying through fog, will pick up the leader-cable and follow it round and round, gradually reducing his altitude till he catches sight of the lines of neon lights and is able to land.

French Electrical Conference.—The Société Française des Electriciens has during the current week held a conference. Among the subjects included in the scheduled programme were "Coefficients of Deformation of Alternator Curves," "Putting Synchronous and Asynchronous Machines in Short Circuit," "Definitions and Measurements of Coefficients of Loss and Reactances in Alternators," "Phase Compensation in A.C. Installations," "The Lighting of Works and Schools," "Motor Headlights," "Traction by Accumulators," and "Rural Electrification."

Trade-mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be lodged within one month from October 28th. In the case of foreign applications, the names and addresses of the British representatives are also given.

N. & K. (lettering and design). No. 447,816. Class 8. Radio-telephonic apparatus.—Neufeldt & Kuhnke, Kiel, Germany. (L. J. Hydleman & Co., 32, Queen Victoria Street, E.C.4.)

Flor (lettering and design). No. 458,318. Class 8. Electric accumulators and parts.—La Société des Accumulateurs Tudor, 60, Chaussée de Charleroi, Brussels. (Marks & Clerk, 57-58, Lincoln's Inn Fields, W.C.2.)

Radiolux-Amplion. No. 461,384. Class 8. Scientific and philosophical instruments and apparatus for useful purposes.—E. A. Graham, trading as Alfred Graham & Co.

Guarding the Pole—the Polar F Light Best Yet Made (lettering and design). No. 460,183. Class 8. Electrical dry cells.—Thomas Henrik Poulsoon, 43, Dronningensgade, Stavanger, Norway. (Phillips', 70, Chancery Lane, W.C.2.)

Hetroflex. No. 461,565. All goods in Class 8.—A. S. Cheetham, 3, Vernon Road, Edgbaston, Birmingham.

Wind design only. No. 461,624. Class 8. Instruments and apparatus for use in connection with radio-telegraphy and telephony.—Consulting and Radio Service, Ltd., 15, Gordon Street, Glasgow.

Nick-o-Time tunometer. No. 462,009. Class 8. Variable inductances.—M. E. Elliott, The Thistles, Kemps Lane, Beccles.

Prodonite. No. 462,418. Class 8. Detector crystals for use in radio-telegraphy and telephony.—S. B. Smith & Co., Ltd., 10, Savoy Street, Strand, W.C.2.

Ino (lettering and design). No. 460,049. Class 13. Electric lamps (ordinary).—Ino Guarantee Lamp Co., Ltd., 35, Aldermanbury, E.C.2.

Elektrolox. No. 460,957. Class 18. Refrigerating chambers and refrigerating plant.—Elektrolox Aktiebolaget, 2 Norrmalmsstorg, Stockholm, Sweden. (Haseltine, Lake & Co., 28, Southampton Buildings, W.C.2.)

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1924.

8,341. "Method of winding for the improvement of the commutation in electric machines provided with commutators." Compagnie Electro-Mécanique. April 16th, 1923. (214,601.)

8,766. "Multiple-wave acoustic apparatus." Signal Ges. May 14th, 1923. (216,105.)

9,145. "Two-way telephonic and telegraphic repeater for use without balancing networks." A. W. Adams. April 10th, 1924. (240,680.)

13,621. "Electrical resistance." A. Dilger and Dubilier Condenser Co., Ltd. June 4th, 1924. (240,890.)

14,128. "Contacts for use in electrical apparatus." Western Electric Co., Ltd. (Western Electric Co., Inc.). June 11th, 1924. (240,895.)

14,184. "Electric driving mechanism for weaving, knitting, and like machines." Siemens-Schuckertwerke Ges. August 23rd, 1923. (220,931.)

14,366. "Control of electric motors." E. J. Ondoli. June 13th, 1924. (240,897.)

15,463. "Apparatus for the reception of wireless signals." N. Lea and Radio Communication Co., Ltd. June 26th, 1924. (240,909.)

15,995. "Screw-plug electric fuses." Siemens-Schuckertwerke Ges. December 13th, 1923. (226,155.)

15,996. "Non-interchangeable electric fuses." Siemens-Schuckertwerke Ges. December 14th, 1923. (226,156.)

16,199. "Means for correcting or minimising distortion of signals in electric telegraph systems." H. V. Higgitt and Eastern Telegraph Co., Ltd. July 5th, 1924. (240,906.)

16,273. "Manufacture of electron-emitting material and apparatus." A. S. Cachemaille (Westinghouse Lamp Co.). July 7th, 1924. (240 909.)

16,328. "Automatic cut-out for use with electrically-heated appliances." G. H. Collins and H. F. Collins. July 8th, 1924. (240,910.)

16,427. "Variable resistances for wireless and other purposes." H. Ingham and H. Clarke & Co. (Manchester), Ltd. July 9th, 1924. (Cognate application, 8,462/25.) (240,917.)

16,492. "Electron valve holders." Burndept, Ltd., L. J. Hunt, and C. F. Phillips. July 9th, 1924. (240,918.)

16,499. "Portable electrocardiographs and the like apparatus." H. E. Nichols and C. H. Chase. July 9th, 1924 (240,919.)

16,513. "Method of and electronic valve for modulating electric currents." E. T. Fisk. July 9th, 1924. (240,920.)

16,716. "Electrically-driven high-speed spindles applicable for use with woodworking machines." A. Ransome & Co., Ltd., and P. S. Robinson. July 11th, 1924. (240,927.)

16,936. "Adapters, connectors, or the like for lamps or other appliances employing electric current." A. J. Jung. July 15th, 1924. (240,937.)

17,611. "Electrodes for electric discharge tubes." General Electric Co., Ltd., and A. C. Bartlett. July 23rd, 1924. (240,944.)

17,670. "Means for bridging terminals of an electric circuit." J. Sutter. July 24th, 1924. (240,946.)

17,840. "Method and apparatus for measuring distance and time intervals, and more particularly for acoustic depth sounding." Submarine Signal Corporation. December 22nd, 1923. (226,489.)

17,966. "Induction couplers or high-frequency transformers." Igranic Electric Co., Ltd., and A. H. Curtis. July 28th, 1924. (240,953.)

17,980. "Apparatus for supplying high-frequency alternating electric current from a low-frequency source." Westinghouse Brake & Saxby Signal Co. (Union Switch & Signal Co.). July 28th, 1924. (240,954.)

18,463. "Electric radiators." Hotpoint Electric Appliance Co., Ltd., and F. W. Leevers. March 6th, 1925. (240,962.)

18,469. "Electric discharge tubes having more than three electrodes." H. Wade (Naamlooze Vennootschap Philips' Gloeilampenfabricken). August 1st, 1924. (240,963.)

18,673. "Construction of rotor conductors for induction motors." J. Lea. August 6th, 1924. (240,967.)

18,808. "Dynamo-electric machines." J. A. Kuyser and Metropolitan-Vickers Electrical Co., Ltd. August 7th, 1924. (Addition to 230,362.) (240,971.)

20,343. "Electric switches." J. A. Crabtree. August 28th, 1924. (240,980.)

20,381. "Means for recharging an accumulator in apparatus requiring supplies of current." L. Barrett. August 28th, 1924. (240,981.)

20,496. "Electric switches." Cable Accessories Co., Ltd., F. H. Reeves, and A. Crawford. August 30th, 1924. (240,982.)

20,585. "Dial indicators for radio instruments." Igranic Electric Co., Ltd., A. H. Curtis, and G. F. Dandridge. September 1st, 1924. (240,983.)

22,933. "Electric condensers." Dr. H. Meusser. September 29th, 1924. (Convention date not granted.) (222,507.)

23,243. "Electric contacts." Siemens Bros. & Co., Ltd., and H. E. Humphries. October 1st, 1924. (240,996.)

23,553. "Crystal detectors for wireless telegraphic and telephonic apparatus." H. Bowyer. October 6th, 1924. (241,001.)

24,941. "Galvanic batteries." Oldham & Son, Ltd., G. H. Darby, and W. D. Wilde. October 20th, 1924. (241,014.)

25,787. "Contact caps for electric discharge devices." British Thomson-Houston Co., Ltd. October 30th, 1923. (224,233.)

25,845. "Electrode holders for use in electric welding and cutting." E. Jamison. October 30th, 1924. (241,023.)

26,036. "Electrical connectors." E. B. Stephenson. November 1st, 1924. (241,026.)

26,302. "Controlling gear for electric vehicles having apparatus operated by compressed fluid." Siemens-Schuckertwerke Ges. August 30th, 1924. (239,155.)

28,369. "Batteries of the type employed in electrotherapeutic treatment of physical ailments or disabilities." E. R. G. Greville and F. W. Read. November 26th, 1924. (241,043.)

30,040. "Radio communication systems." Soc. Française Radio-Electrique. December 13th, 1923. (226,227.)

30,666. "Electron discharge devices." Western Electric Co., Ltd. (Western Electric Co., Inc.). December 20th, 1924. (241,050.)

1925.

168. "Devices for cooling electrodes of discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. January 24th, 1924. (228,130.)

4,630. "Method of and means for moulding insulators formed from porcelain, clay, or the like." British Thomson-Houston Co., Ltd. (General Electric Co.). February 19th, 1925. (240,713.)

4,697. "Crystal detector for wireless reception." J. P. Eckersley. February 20th, 1925. (240,714.)

4,811. "Electrical condensers." G. A. Laughton. February 21st, 1925. (240,716.)

5,683. "Process for local treatment of the surface of electric insulators." Porcelainfabrieken Norden Aktieselskabet. March 5th, 1924. (230,445.)

5,820. "System for the reception or emission of high-frequency electromagnetic waves or of low-frequency fields." Soc. Industrielle des Procédés W. A. Loth. March 8th, 1924. (230,452.)

5,854. "Electric cables." Johnson & Phillips, Ltd., and D. A. S. Porteous. March 3rd, 1925. (Addition to 230,764.) (240,721.)

6,647. "Systems of electric motor control." British Thomson-Houston Co., Ltd. (International General Electric Co. Inc.). March 11th, 1925. (240,725.)

7,368. "Electrolytic manufacture of iron." Le Fer Soc. Anon. March 24th, 1924. (231,179.)

7,679. "Electric radiators." W. Joice. March 21st, 1925. (240,372.)

7,838. "Continuous inductive train control." General Railway Signal Co. April 7th, 1924. (231,852.)

8,496. "Electric apparatus comprising a filament of highly refractory material." Naamlooze Vennootschap Philips Gloeilampenfabrieken. April 5th, 1924. (231,861.)

8,839. "Electric heat accumulators." S. Sacerdote. April 2nd, 1924. (231,878.)

9,244. "Automatic switching systems." British Thomson-Houston Co., Ltd. April 8th, 1924. (232,226.)

9,328. "Variable air condensers for wireless telegraphy." C. R. Jarvie. April 8th, 1925. (240,741.)

9,770. "Electrolytic rectifiers or valves." Elecktro-tau-Ges. April 14th, 1924. (232,271.)

9,975. "Subaquatic electric cables." Felten & Guilleaume Carlswerk Akt. Ges. June 7th, 1924. (235,151.)

10,380. "Electric regulating system." British Thomson-Houston Co., Ltd. April 21st, 1924. (232,641.)

10,585. "Portable dynamo-electric machines." I. Zbar. April 26th, 1924. (232,971.)

10,722. "Electric discharge devices for converting electric power." Hazeltine Research Corporation. July 5th, 1923. (Divided application on 16,121/24.) (232,980.)

10,727. "Methods of mounting filaments for incandescent lamps and the like." Westinghouse Lamp Co. May 12th, 1924. (233,683.)

11,037. "Electric arc-welding machines." British Thomson-Houston Co., Ltd. April 28th, 1924. (232,995.)

12,024. "Connecting terminals for electric conductors." O. Ommundsen. May 8th, 1924. (233,724.)

13,452. "Method of cooling the electrodes in ozonisers." R. Graef. May 22nd, 1925. (241,125.)

13,616. "Headlight deflectors." R. L. Anderson. May 25th, 1925. (240,098.)

13,659. "Electric water-heaters." T. H. McQuinn. May 25th, 1925. (240,762.)

14,768. "Dynamo-electric machines." British Lighting & Ignition Co., Ltd., and J. C. Hutton. May 16th, 1924. (Divided application on 239,908.) (240,100.)

15,114. "Telegraph typewriters." Kleinschmidt Electric Co. Inc. July 5th, 1923. (Divided application on 218,643.) (235,573.)

15,117. "Telegraph typewriters." Kleinschmidt Electric Co. Inc. August 11th, 1923. (Divided application on 220,280.) (235,576.)

15,348. "Automatic voltage regulation of alternating-current circuits, particularly for welding machines." J. J. V. Armstrong (Naamlooze Vennootschap W. Smit & Co.'s Transformatorenfabriek). June 13th, 1925. (241,133.)

15,584. "Apparatus for supplying electric current to vacuum tubes." Reiniger, Gebbert & Schall Akt. Ges. June 17th, 1924. (235,872.)

15,622. "Anti-glare headlight lenses." C. H. Tumey, sen., M. D. Nealon, and M. Tumey. June 16th, 1925. (240,393.)

15,843. "Variable condensers for use with high-frequency circuits." E. Picard. June 19th, 1925. (240,769.)

17,031. "Starting and stopping devices for electromagnetic talking-machines." Telegraphie-Ges. System Stille. July 3rd, 1924. (236,573.)

17,150. "Aerials for wireless telegraphy and telephony." Telefunken Ges. fur Drahtlose Telegraphie. July 25th, 1924. (237,584.)

17,549. "Electrical heating elements." W. Guy-Pell. December 9th, 1924. (Divided application on 29,587/24.) (241,141.)

18,335. "Headlights for motor vehicles." W. V. Van Etten. July 17th, 1925. (240,111.)

18,700. "Method of manufacturing electron-emitting cathodes." Suddeutsche Telefon-Apparate-Kabel-und Drahtwerke Akt.-Ges. July 24th, 1924. (237,614.)

18,787. "Electrical frequency filters." Westinghouse Electric & Manufacturing Co. August 9th, 1924. (238,211.)

19,855. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd. December 14th, 1923. (Divided application on 226,154.) (238,245.)

Steam Generation on "Coal Site."—We have received some particulars of an extremely interesting event which recently occurred at the Barnsley electricity works. Some months ago it was arranged to construct an ash tunnel in the boiler house immediately under the "Bennis" chain grate stoker equipment of one of the boilers. The work of excavation had not been long in progress before a seam of useful coal, 1 ft. 8 in. thick, was uncovered. Twenty tons of coal were removed from immediately beneath the stoker into which it was fed direct, thus providing fuel for several hours' run.